

2006 IVRA/ACVR CONFERENCE PROCEEDINGS

Sunday, August 6, 2006

3:00 pm Registration Opens

6:00 pm *Welcome Reception*

Monday, August 7, 2006

7:00 am *Breakfast*

9:00 am **Opening Remarks – IVRA President, ACVR President**

9:30 am **Keynote Address**
“Tourism in BC: Ten Years of 2010”
Ray LeBlond
Director, Corporate Communications
Tourism British Columbia

10:30 am Break with Exhibitors

11:00 am **Scientific Session 1: General Radiology**
Moderator: Dr. Kari Anderson

11:00 am [Thoracic Radiographic Predictors of Diagnosis in Dogs with Cranial Mediastinal Masses](#)
Michael Roy

11:12 am [Radiographic and Fluoroscopic Evaluation of Tracheal Collapse in 51 Dogs](#)
Dawn Macready

11:24 am [Feline Thoracic Radiography with a Large-Scale Electronic-Flat Detector and a Storage-Phosphor System: Is There an Influence of Exposure Settings on the Image Quality?](#)
Eberhard Ludewig

11:36 am [Feline Asthma: Prevalence of Radiographic Abnormalities](#)
Marc-Andre d’Anjou

11:48 am [Canine Pulmonary Blastomycosis](#)
Laura Crews

- 12:00 pm [Imaging Feature of Orbital Myxosarcomata in Dogs](#)
Ruth Dennis
- 12:12 pm [Brain Imaging and the Cognitive Pathways of the Veterinary Radiologic Diagnostic](#)
Mara Massad
- 12:30 pm *Lunch*
- 1:30 pm *Associates Activity - Tour of City and Museum of Anthropology*
- 1:30 pm **Scientific Session 2: General Radiology**
Moderator: Dr. Jens Arnbjerg
- 1:30 pm [Relationship of Intestine Diameter & Gas to Obstruction in the Cat](#)
William Adams
- 1:42 pm [Prevalence and Risk Factors for Hip Joint Degenerative Disease in Dogs in a Veterinary Teaching Clinic in Tanzania](#)
Modesta Makungu
- 1:54 pm [The Radiographic Quarantine of Hip and Elbow Dysplasia of German Shepherd in Northeast China](#)
Huijun Xiong
- 2:06 pm [Hind Leg-Angles, Spondylosis, and Arthrosis in the Chow Chow](#)
Jens Arnbjerg
- 2:18 pm [Radiographic Presentation of the Equine Sacroiliac Region](#)
Daniela Gorgas
- 2:30 pm [Radiographic and Ultrasonographic Examination of Synovial Intervertebral Joints of the Equine Cervical Spine](#)
Fabrice Audigie
- 2:42 pm [Radiographic studies on Coenurosis in Goats](#)
Jitendra Lekharu
- 3:00 pm Break with Exhibitors
- 3:30 pm **Scientific Session 3: Ultrasound**
Moderator: Dr. Paul Barthez
- 3:30 pm [The Use of Ultrasonography to Guide Therapy in Fracture Delayed Unions](#)
Marije Risselada

- 3:42 pm [Changes in Echocardiographic Variables of Left Ventricular Size and Function in a Model of Canine Normovolemic Anemia](#)
Tim Spotswood
- 3:54 pm [Ultrasonographic Characteristics of Intrathoracic Lesions in Dogs and Cats](#)
Katharina Hittmair
- 4:06 pm [Ultrasonographic Examination of Small Organs in the Canine Abdomen](#)
Elke Schreurs
- 4:18 pm [Detection of Insulinomas in Dogs with Endoscopic Ultrasound](#)
Lorrie Gaschen
- 4:30 pm [Ultrasonographic Parameters of the Normal Ferret Gastrointestinal Tract](#)
Jessica Basseches
- 4:42 pm [Effect of Ultrasound Beam Angle on Equine Articular Cartilage Thickness Measurement](#)
Paul Barthez
- 4:54 pm [Collateral Ligaments Injuries of the Equine Hock Diagnosed by Ultrasonography: Retrospective Study of 11 Cases](#)
Geraldine Bolen
- 5:06 pm [Ultrasonographic Findings in 55 Horses Suspected of Tarsal Joint Pathology](#)
Jimmy Saunders
- 5:18 pm [Prognostic Relevance of Ultrasonographical Findings in Race Horses with Tendon Injuries in Turkey: Preliminary Results](#)
Deniz Seyrek Intas
- 7:00 pm *Group Dinner in Hotel*

Tuesday, August 8, 2006

- 7:00 am *Breakfast*
- 7:00 am Ultrasound Society Business Meeting
- 8:00 am **Ultrasound Society Guest Speaker**
“Abdominal Doppler: Useful or Not?”
Jean Buckley, MD
Vancouver General Hospital

- 9:00 am **Scientific Session 4: Ultrasound**
Moderator: Dr. John Mattoon
- 9:00 am [Clinical Utility of the Right Lateral Intercostal Ultrasound Scan Plane](#)
Erin Brinkman
- 9:12 am [Hepatic Transit Time of the Signal Enhancer Sonovue in the Dog](#)
Antje Hause
- 9:24 am [Sonography Estimation of Gallbladder Volume in Normal Adult Dogs](#)
Hock Gan Heng
- 9:36 am [Use of Contrast Harmonic Ultrasound for the Characterization of Focal Lesions of the Spleen: 21 Cases](#)
Federica Rossi
- 9:48 am [Ultrasonographic and Pathologic Correlation of Corrugated Small Intestine Caused by Lymphoma in Two Dogs](#)
Tsutomu Daikokuya
- 10:00 am Break with Exhibitors
- 10:20 am **Scientific Session 5: Ultrasound**
Moderator: Dr. Taka Miyabayashi
- 10:24 am [Assessment of Postoperative Ultrasonographic Appearance of Uncomplicated Enterotomy or Enterectomy Sites in Dogs](#)
Andrea Matthews
- 10:36 am [The Morphological Significance of Ultrasonographic Intestinal Hyperechoic Striations in Dogs](#)
James Sutherland-Smith
- 10:48 am [Three-Dimensional Color Doppler Ultrasonography of the Kidney Vasculature and Blood Flow Analysis in Dog](#)
Mohammad Molazem
- 11:00 am [Kidney-to-Aorta Ratio: A New Ultrasonographic Method in Estimating Renal Size in Dogs](#)
Marc-Andre d'Anjou
- 11:12 am [Sonographically Determined Kidney Circulation Parameters in Dogs Under the Influence of Selected Anesthesia Protocols](#)
Ingmar Kiefer

- 11:24 am [Contrast-Enhanced Ultrasonography of the Canine Kidney](#)
Jennifer Kinns
- 11:36 am [Hypoechoic Subcapsular Thickening in Feline Kidneys: Association with Malignant Lymphoma](#)
Alejandro Valdes-Martinez
- 11:48 am [Ultrasonographic Determination of the Relative Kidney Size in a Dog](#)
Wencke Wagner
- 12:30 pm *Group Activity - Free Time for Lunch in Gastown and Storyeum
Granville Island - Transportation Provided*
- 6:00 pm *Dinner at Dockside Restaurant - Granville Island*

Wednesday, August 9, 2006

- 7:00 am *Breakfast*
- 7:00 am Nuclear Medicine Society Business Meeting
- 8:00 am **Nuclear Medicine Panel Discussions**
- 8:30 am *Associates Activity - China Town, Sun Yat-Sen Gardens and
Robson Street Shopping*
- 9:00 am **Scientific Session 6: Nuclear Medicine**
Moderator: Dr. Anne Bahr
- 9:00 am [Potential for Aerosolization of I-131 Once Excreted in Feline Urine](#)
Jason Francis
- 9:12 am [^{99m}Tc-DTPA Diuretic Renography in Dogs with Urolithiasis](#)
Silke Hecht
- 9:24 am [Glomerular Filtration Rate Normalized to Plasma Volume is Not Affected
by Intravenous Fluid Administration](#)
Peter Lord
- 9:36 am [Dynamic Uptake Studies of 2-deoxy-2-\(¹⁸F\) Fluoror-D-Glucose \(¹⁸FDG\)
in Normal Dogs](#)
Amy LeBlanc

- 9:48 am [Single-Photon Emission Computed Tomography in Dogs with Insulinoma: Comparison with Somatostatin Receptor 1, 2, 3, and 5 Expression](#)
Susanne Boroffka
- 10:00 am Break with Exhibitors
- 10:30 am **Scientific Session 7: General Imaging**
Moderator: Dr. Jimmy Saunders
- 10:30 am [Comparison Between Nuclear Scintigraphy and Transrectal Ultrasonography in the Detection of Sacroiliac Abnormalities](#)
Virginie Coudry
- 10:42 am [Coxo-Femoral Injuries Diagnosed by External Ultrasonography or Standing Radiography in Equidae: Retrospective Study of 9 Cases](#)
Virginie De Busscher
- 10:54 am [Ultrasonographic Findings in 57 Horses Suspected of Stifle Joint Pathology](#)
Michel Hoegaerts
- 11:06 am [Accuracy of Ultrasonography in the Diagnosis of Recurrent Laryngeal Neuropathy in Horses](#)
Heather Chalmers
- 11:18 am [The “Magic Angle” Effect, a Possible Cause of Increased Magnetic Resonance Imaging Signal Intensity in the Collateral Ligaments of the Distal Interphalangeal Joint in Horses](#)
Mathieu Spriet
- 11:30 am **Poster Session with Authors**
- Poster 1 [M-Mode Ultrasonographic Measurement Of Distance Between Mitral Valve A Point And Interventricular Septum In Iranian Arabic Horse](#)
Gholamreza Assadnassab
- Poster 2 **WITHDRAWN**
- Poster 3 [Virtual Radiography of the Horse](#)
Caroline Boulocher **WITHDRAWN**
- Poster 4 [Preliminary Evaluation of a Protocol for Fast Localized Abdominal Sonography in Horses \(FLASH\) Admitted for Colic](#)
Valeria Busoni

- Poster 5 [Evaluation of Canine Partial Cruciate Ligament Rupture with Computed Tomographic Arthrography](#)
Dongwoo Chang
- Poster 6 [Three-Dimensional CT Angiography of Canine Hepatic Vasculatures](#)
Mincheol Choi
- Poster 7 [Feline Radiographic Digital Image Bank](#)
Mairi Frame **WITHDRAWN**
- Poster 8 [Duplex Doppler Ultrasound of Cerebral Vasculature in Dogs with Neurological Disorders](#)
Cassia Garcia Silva
- Poster 9 [Radiographic Findings in Several Joints on Nine Zoo Bears](#)
Urs Geissbuhler
- Poster 10 [A Standardized Protocol for the Ultrasound Examination of the Equine Tarsus](#)
Michel Hoegaerts
- Poster 11 [Comparative Imaging of a Chronic Injury of the Hind Fetlock of a Racing French Trotter](#)
Sandrine Jacquet
- Poster 12 [Evaluation of Traumatic Intracranial Hemorrhage Using CT and MRI in Dogs](#)
Seong Mok Jeong
- Poster 13 [Comparison of Hepatic VX2-Carcinomas After Intraportal and Intraparenchymal Tumor Cell Injection: A Computed Tomographic and Histopathological Study in Rabbits](#)
KiChang Lee
- Poster 14 [Fluid Accumulation in Canine Tympanic Bulla: Radiography, CT, and MRI Evaluations](#)
Young-Won Lee
- Poster 15 [Clinical Anatomy of the Canine Brain Using Magnetic Resonance Imaging](#)
Edmund Leigh
- Poster 16 [Normal Pulsed-Wave Doppler Ultrasonography of Abdominal Aorta in Rabbits](#)
Majid Masoudifard

- Poster 17 [Ultrasonography and CT of the European Eel: Potential Applications in Reproductive Management](#)
Fintan McEvoy
- Poster 18 [Magnetic Resonance Imaging Characteristics and Detection of an Autoantibody in the Cerebrospinal Fluid \(CSF\) with Suspected Necrotizing Meningoencephalitis \(NME\) in Eleven Dogs](#)
Tetsuya Nakade
- Poster 19 [Computed Tomography of the Head and Cranial Neck in the Standing Sedated Horse](#)
Alastair Nelson
- Poster 20 [Functional Renal Imaging in Cats Using ^{99m}Tc-DMSA](#)
Kathelijne Peremans
- Poster 21 [Effect of Weight Gain on Bone Mineral Density in Beagles](#)
Diana Rosenstein
- Poster 22 [Ultrasound-Guided Percutaneous Nephrostomy in Dogs](#)
Ingrith Santarosa
- Poster 23 [Animal's Bones Microstructure Analysis](#)
Natalia Slesarenko
- Poster 24 [Comparison of Two Different Orientations of the Transverse and Dorsal Images for Magnetic Resonance Imaging of the Equine Foot](#)
Mathieu Spriet
- Poster 25 [Ultrasonographic Guided Intra Ovary Injection of Destructing Agents for Sterilization of Female Dog](#)
Alireza Vajhi
- Poster 26 [Doppler Imaging of the Orbital Vasculature of the Normal Puppy German Shepherd Dog](#)
Dariush Vosough
- Poster 27 [Possibility of the Use of Three Dimensional Ultrasounds and Measurement of Optical Along Axis of German Shepherd Dog](#)
Dariush Vosough
- Poster 28 [Canine Bladder Trigone Diverticulum](#)
Wencke Wagner

- Poster 29 [Advantages and Disadvantages of Flat-Panel Volumetric Computed Tomography \(fpvCT\) Compared with Conventional CT in Veterinary Medicine](#)
Antje Wigger
- Poster 30 [Histopathologic Studies of the Disruption of Murine Tumor Vasculature by Mild-Intensity Ultrasound](#)
Andrew Wood
- 12:30 pm *Lunch*
- 1:30 pm **ACVR Business Meeting**
- 3:30 pm **ECVDI Business Meeting**
Radiation Oncology Society Business Meeting
- 6:00 pm *Free Evening on Your Own for Dinner*

Thursday, August 10, 2006

- 7:00 am *Breakfast*
- 7:00 am VRTOG Business Meeting
- 8:00 am **Radiation Oncology Society Guest Speaker**
“Advancing Treatment Options for Cancer in Animals through a Comparative Approach”
Chand Khanna, DVM, PhD, Dipl ACVIM
National Cancer Institute / National Institutes of Health
- 9:00 am **Scientific Session 8: Radiation Oncology**
Moderator: Dr. Lisa Forrest
- 9:00 am [Coarse Fraction Chemoradiation in Treatment of Head and Neck Neoplasia in Dogs](#)
William Adams
- 9:12 am [Relationship of Clinical Stage and Tumor Histology to Recurrence of Canine Nasal Neoplasia Following Radiotherapy](#)
William Adams
- 9:24 am [Retrospective Evaluation of Late Complications in 36 Patients Undergoing Definitive Radiation](#)
Jennifer Arthur

- 9:36 am [Photodynamic Therapy \(PDT\) for the Treatment of Feline Cutaneous Squamous Cell Carcinoma](#)
Julia Buchholz
- 9:48 am [Treatment of Canine Bladder Cancer Using Minimally Invasive Intraoperative Radiotherapy \(MIR\)](#)
Lisa Forrest
- 10:00 am Break with Exhibitors
- 10:30 am **Scientific Session 9: Oncologic Imaging**
Moderator: Dr. Michael Herrtage
- 10:32 am [Preoperative Versus Postoperative 3D Radiation Treatment Planning for Soft Tissue Tumors](#)
Margaret McEntee
- 10:44 am [Retrospective Review of 50 Canine Nasal Tumors Evaluated by Low Field Magnetic Resonance Imaging](#)
Michael Herrtage
- 10:56 am [Assessment of Novel Treatment Efficacy for Canine Spontaneous Tumors with Dynamic Contrast Enhanced MRI](#)
Susan Kraft
- 11:08 am [Dynamic Contrast Enhanced Computed Tomography of Normal Brain and Intracranial Mass Lesions in Dogs](#)
Alexander MacLeod
- 11:20 am [Cross-Sectional Imaging Characteristics of Pituitary Adenomas and Adenocarcinomas in Dogs: 24 Cases](#)
Megan Uerling
- 11:32 am [Generalized Cerebral Atrophy Seen on MRI in Asymptomatic and Symptomatic Scrapie Infected Sheep From a Naturally Exposed Flock](#)
Alexia McKnight
- 11:44 am [Contrast Ultrasound Assessment of Angiogenesis in a Matrigel Model in Rats](#)
Susanne Stieger
- 12:30 pm *Group Outing - Box Lunch
Vancouver Aquarium, Grouse Mountain (Dinner on Your Own)
Transportation Provided*
- 8:00 pm *Free Evening on Your Own*

Friday, August 11, 2006

- 7:00 am *Breakfast*
- 7:00 am CT/MRI Society Business Meeting
- 8:00 am **CT/MRI Society Guest Speaker**
“Incidental Findings on CT Examinations – Economic & Ethical Impact”
Zeev Maizlin, MD
St. Paul’s Hospital, Vancouver
- 9:00 am **Scientific Session 10: CT/MRI**
Moderator: Dr. Vic Rendano
- 9:00 am [A Comparison of Iopamidol with Iopromide and Iohexol Contrast Media in Hepatic CT Angiography in Beagle Dogs](#)
Mincheol Choi
- 9:12 am [Multidetector CT Angiography in Acquired Anomalies of the Canine Portal Venous System Due to Portal Hypertension: Three Cases](#)
Giovanna Bertolini
- 9:24 am [Transplenic CT-Portography Using a Multi-Row Detector Helical Scanner: Comparison to CT-Angiography in Normal Dogs](#)
Rita Echandi
- 9:36 am [Hepatic Volume Estimation Using Computed Tomography in Dogs with Portosystemic Shunts](#)
Susanne Stieger
- 9:48 am [Dynamic CT Quantitation of Hepatic Perfusion in Dogs With and Without Portal Vascular Anomalies](#)
Allison Zwingenberger
- 10:00 am [Computed Tomographic Features of Normal Pancreas and Experimental Acute Pancreatitis in Dogs](#)
Junghee Yoon
- 10:12 am [Characterization of Feline Renal Vessel Anatomy with Dual-Phase CT Angiography](#)
Ana Caceres
- 10:24 am [Computed Tomographic Features of Canine Masticatory Myositis and Other Causes of Masticatory Pain](#)
Tobias Schwarz

- 10:40 am Break
- 10:50 am **Scientific Session 11: CT/MRI**
Moderator: Dr. Junghee Yoon
- 10:50 am [The Effect of CT Image Display Parameters on the Diagnostic Certainty for Abnormalities in Dogs with Elbow Dysplasia](#)
Jeryl Jones
- 11:02 am [Use of Intravenous Contrast Media in Abdominal CT in Birds](#)
Michaela Gumpenberger
- 11:14 am [Magnetic Resonance Imaging Changes in the Equine Foot in the Initial Active Stage of Laminitis](#)
Jason Arble
- 11:26 am [Magnetic Resonance Imaging of the Canine Menisci](#)
Laurent Blond
- 11:38 am [Clinical Experience with MRI at 3T](#)
Bernard Walsh
- 11:50 am [Correlation Between MRI and Histology of Bone Marrow Changes in the Proximal Tibia in 5 Dogs with Experimentally Induced Osteoarthritis](#)
Johann Lang
- 12:00 pm *Lunch*
- 1:00 pm **EAVDI Business Meeting**
- 2:00 pm **Film Reading Session**
- 4:00 pm Break
- 4:15 pm **IVRA Business Meeting**
- 6:00 pm *Farewell Reception and Dinner at Hotel*

* *Italicized items include guests.*

THORACIC RADIOGRAPHIC PREDICTORS OF DIAGNOSIS IN DOGS WITH CRANIAL MEDIASTINAL MASSES. M.E. Roy, R.H. Wrigley, S.L. Kraft, P. Steyn, L.J. Zekas, R.D. Park, S.J. Withrow. College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523.

Introduction/Purpose: Cranial mediastinal masses (CMM) in dogs are commonly diagnosed by thoracic radiography. Differentiating between causes of CMM is challenging prior to biopsy. Thymoma and lymphoma are reported to be the two most common causes of CMM. Recent articles have suggested that neither ultrasonographic nor CT evaluation are rewarding in establishing the cause of CMM. The purpose of this study was to identify thoracic radiographic findings in dogs with a CMM, and correlate them with diagnosis.

Methods: Medical records of dogs seen at the CSU-VTH between 1999 and 2005 were reviewed. Inclusion criteria were a solitary mass in the cranial mediastinum on thoracic radiographs, with histopathologic confirmation. Patients with sufficient pleural effusion to obscure visualization or measurement of a cranial mediastinal mass were excluded. Dogs with obvious sternal and/or cranial mediastinal lymph node enlargement were also excluded.

Results: Forty-nine patients met the inclusion criteria. Thoracic radiographs were evaluated for size (standardized as largest measurement of mass/thoracic inlet width), as well as the presence of megaesophagus, pleural effusion, pneumonia, or pulmonary nodules. Diagnoses included: 22/49 (45%) thymoma, 15/49 (31%) lymphoma, 3/49 (6%) thyroid carcinoma, 3/49 (6%) non-thyroid carcinoma, 3/49 (6%) cranial mediastinal cyst(s), 1/49 (2%) aortic body tumor, 1/49 (2%) liposarcoma, and 1/49 (2%) melanoma. The median and mean overall mass/thoracic inlet (M/TI) were 1.067 and 1.217, respectively. These values were 0.728 and 1.223 for thymoma M/TI, 0.933 and 1.136 for lymphoma M/TI, 1.556 and 1.652 for carcinoma (thyroid and non-thyroid origin) M/TI, and 0.900 and 0.823 for cranial mediastinal cyst M/TI. Five dogs had megaesophagus (4/5 thymoma, 1/5 lymphoma); 4/22 dogs with thymoma had megaesophagus, and 1/15 dogs with lymphoma had megaesophagus. Fourteen dogs had pleural effusion (5/14 thymoma, 5/14 lymphoma, 2/14 carcinoma, 1/14 liposarcoma, and 1/14 aortic body tumor); 5/22 dogs with thymoma had pleural effusion, and 5/15 dogs with lymphoma had pleural effusion. Three dogs had pneumonia (all had thymoma with megaesophagus). Two dogs had pulmonary nodules; one had an aortic body tumor, and one had a cranial mediastinal cyst.

Discussion/Conclusions: The size of a CMM cannot be used to predict diagnosis. Pleural effusion is relatively common in dogs with CMM, although its presence cannot be used to differentiate the cause of the CMM. Results are consistent with previous reports that megaesophagus is more common with thymoma than with other causes of CMM. This study also confirms that thymoma and lymphoma are the most common causes of CMM, representing 76% of the CMM evaluated.

RADIOGRAPHIC AND FLUOROSCOPIC EVALUATION OF TRACHEAL COLLAPSE IN 51 DOGS. D. M. Macready, L.R. Johnson, R.E. Pollard. University of California, Davis School of Veterinary Medicine, CA, 95616

Introduction/Purpose: Tracheal collapse is a common cause of cough in small breed dogs. Fluoroscopy is considered a gold standard technique for the detection of tracheal collapse but is not widely available to veterinary practices. Cervical and thoracic radiographs are often used for the evaluation of coughing dogs where tracheal collapse is a potential cause. The purpose of this study was to compare radiographs with fluoroscopy for the detection of tracheal collapse in 51 dogs.

Methods: UC Davis VMTH records were searched for dogs diagnosed with tracheal collapse using fluoroscopy and having cervical and thoracic radiographs during the period from 2/6/01-7/6/05. A board-certified radiologist masked to clinical history and radiographic findings evaluated radiographs and fluoroscopic videos of all cases. Cervical, thoracic inlet, thoracic, and carina regions of the trachea were individually evaluated for collapse. In each region, the degree of collapse was graded as 0, 25, 75, or 100 based on the percentage decrease in tracheal diameter as a result of collapse. When available, both inspiratory and expiratory radiographs were evaluated. Additionally, fluoroscopic images were graded in the four regions of the trachea on inspiration, expiration, and during a cough. The percentage of radiographs that agreed with fluoroscopy was determined to assess how often radiographs detected tracheal collapse. Additionally, the percentage of radiographs that showed collapse in the same region of the trachea as fluoroscopy and graded collapse similarly to fluoroscopy was calculated.

Results: All fluoroscopy examinations were positive for tracheal collapse. Radiographs demonstrated collapse in 76% of the cases that had collapse on fluoroscopy. When radiographs did show collapse, it was present in the same region of the trachea relative to fluoroscopy in 68% of cases. Radiographs typically underestimated the grade of collapse and showed the same grade of collapse in only 19% of the cases relative to fluoroscopy. The sensitivity of radiographic detection of tracheal collapse was 76%. The positive predictive value was 100%.

Discussion/Conclusions: Radiographs and fluoroscopy are complimentary imaging techniques. In comparison to fluoroscopy, radiographs under-diagnose the frequency and underestimate the degree of tracheal collapse. However, radiographs are worthwhile for screening dogs with potential tracheal collapse.

FELINE THORACIC RADIOGRAPHY WITH A LARGE-SCALE ELECTRONIC-FLAT DETECTOR AND A STORAGE-PHOSPHOR SYSTEM: IS THERE AN INFLUENCE OF EXPOSURE SETTINGS ON THE IMAGE QUALITY?

A. Werrmann, E. Ludewig, A. Richter*, G. Oechtering - Department of Small Animal Medicine and Large Animal Clinic for Theriogenology and Ambulatory Services*, University of Leipzig; An den Tierkliniken 23, D-04103 Leipzig, Germany

Introduction: In digital radiography detail visibility is dependent on the signal-to-noise ratio (SNR) which is influenced by the radiation dose. Because of the wide exposure latitude of digital detectors, adjustment of the radiation dose to a suitable image quality is discussed. In principle over a certain range, dose reduction seems to be achievable without loss of diagnostic information. With the introduction of large-area, flat-panel direct detector systems there is the option to further lower the radiation dose, since these detectors have higher detective quantum efficiency (DQE) compared with storage phosphor systems. The purpose of the comparative study is to evaluate the effects of dosage on the image quality of two digital detectors for routine small animal thoracic radiography.

Material and Methods: Series of right lateral thoracic radiographs of 46 anaesthetized normal cats were acquired by use of two digital detector systems under otherwise uniform conditions for signal recording, signal post-processing, and image reading.

1. DR-system (DR-s): amorphous silicon-based electronic flat-panel detector TRIXELL-PHILIPS - detector size: 43 x 43 cm, spatial frequency: 3.5 lp/mm, DQE: 65 %
2. CR-system (CR-s): storage-phosphor system FUJI HR/PHILIPS AC 500 - detector size: 18 x 24 cm, spatial frequency: 5.0 lp/mm, DQE: 21 %

From each animal 4 radiographs were taken with varied exposure settings in order to simulate system sensitivities (S-value) of 100 and 400 (DR-s: 42 kVp / 6.3 mAs (S = 100) – 42 kVp / 3.2 mAs (S = 400); CR-s: 50 kVp / 6.3 mAs (S = 100) – 42 kVp / 6.3 mAs (S = 400)).

Blinded hard-copy reading was performed under standardised conditions. Five experienced observers scored the images using a four-point scale with respect to (1.) visibility of small vessels in the cranial lung field, (2.) rendition of structures within the caudo-dorsal lung field, (3.) identification of the cardiac silhouette, (4.) delineation of trachea and stem bronchi, and (5.) radiolucency and bordering of the sternum. Non-parametric test statistics were performed to compare mean value differences.

Results: Both detectors used in the study have the potential to record the full amount of information: all image features in all animals were of diagnostic image quality. For both detector systems an influence of the exposure settings on the visibility of the thoracic structures was found: low image-noise improves image quality of all features on the DR-s and in 3 out of 5 structures on the CR-s. While comparing the detectors on the basis of identical exposure settings (42 kVp / 6.3 mAs) 4 out of the 5 features were rated equally. Comparisons on the basis of doses differences (as simulated by use of simulated S-values of 100 and 400) demonstrate inhomogeneous assessment - nevertheless evidence of influence of DQE-differences can not be excluded.

Discussion – Conclusions: Both detector technologies have the potential to display small and low-contrast thoracic structures. In agreement with results derived from human studies higher doses increase SNR and can substantially improve detail visibility. The DQE of the flat panel detector exceeds this of the storage phosphor system by the factor 3 and therefore offers a theoretical degree of dose saving. Under the specific investigative conditions this influence - although demonstrable - should not be overestimated. Further comparative studies could be helpful to determine the potential for detector-related dose reduction.

FELINE ASTHMA: PREVALENCE OF RADIOGRAPHIC ABNORMALITIES.

M.A.d'Anjou, J. Gadbois, M. Dunn, G. Beaugard, J. D'Astous, G. Beauchamp, Department of Clinical Sciences, Faculty of Veterinary Medicine, University of Montreal, St-Hyacinthe, Quebec, Canada J2S 7C6.

INTRO/PURPOSE: Feline asthma is an important cause of respiratory distress in cats and diagnosis greatly relies on radiographic signs. Although these signs are well described, studies evaluating their relative prevalence in large populations of cats are lacking. The purpose this study was to evaluate several radiographic parameters in asthmatic cats and to compare some of these parameters to normal cats.

METHOD: Forty cats with chronic lower airway disease (asthma) (based on clinical signs, LBA +/- response to treatment), and 40 age and weight-matched non-asthmatic cats were included. Lateral and ventrodorsal (VD) radiographs of the asthmatic cats were evaluated by 2 radiologists and several parameters were scored by consensus: lung pattern, lung hyperlucency, lung hyperinflation, bronchial dilatation, vascular dilatation or tortuosity, cardiomegaly, and aerophagia. In both groups, ratios comparing lung field expansion were measured on VD radiographs and compared using a Student t-test: lung field width at T7 / width vertebral body T7; and maximal lung field width/ width vertebral body T7.

RESULTS: Radiographic abnormalities were observed in all asthmatic cats. A bronchial pattern was present in 37 of these cats: mild (13), moderate (20), severe (4). This pattern was ill-defined in 26 cats and well-defined in 11 cats. Bronchial mineralization was suspected in 25 cats. An unstructured interstitial pattern was observed in 30 cats, focal (2) or diffuse (28), and uniform (16) or heterogeneous (14). Nodular, tubular or amorphous soft tissue opacities were observed in the lungs of 11 cats. A lobar alveolar pattern was seen in 2 cats, associated with atelectasis in one (left cranial lobe). Focal, multifocal or diffuse lung hyperlucency was suspected in 21 cats and the diaphragm was flattened or irregular, in 31 cats and 12 cats, respectively. Other radiographic signs included: aerophagia (19), bronchial dilatation (7), vascular tortuosity and/or dilatation (7), cardiomegaly (7), mediastinal shift (4). The chest was hyperinflated on VD views in 26 cats. Averaged ratios of lung field width over the width of T7, at the level of T7 and at maximal expansion, on VD views, were significantly higher in asthmatic cats (8.0 and 11.3) compared to normal cats (6.6 and 8.8) ($p \leq 0.0001$).

DISCUSSION/CONCLUSION: In a population of asthmatic cats referred to our teaching hospital, the predominant radiographic sign observed was a bronchial pattern (93%), although it was inexistent or mild in up to 16 cats (40%). Other common signs included: diaphragm flattening (78%), unstructured interstitial pattern (75%), lung hyperlucency (-ies) (53%), aerophagia (48%), and abnormal lung soft tissue opacities (30%) that could indicate granulomas or mucus plugs. A designed ratio also confirmed the presence of lung hyperinflation in asthmatic cats, likely consecutive to air trapping. Lobar atelectasis, another commonly described sign, was evident in only one cat. A second study will evaluate the inter and intra-observer variability for evaluators of different radiological backgrounds.

CANINE PULMONARY BLASTOMYCOSIS. L.J. Crews, A.B. Newman, C.J. Jessen, D.A. Feeney. University of Minnesota Veterinary Medical Center, MN, 55108.

Introduction: Observation of varied pulmonary radiographic patterns from clinical canine pulmonary Blastomycosis generated concern for confusion with other pulmonary diseases. Only limited information on the relative frequency of canine Blastomycosis-induced pulmonary patterns is available, and no data on the relevance of those pulmonary patterns and/or their distribution compared to dog survival could be found.

Methods: A retrospective study of dogs diagnosed with pulmonary Blastomycosis from January 1, 1989 through January 31, 2006 was performed to test three hypotheses. 1) That varied and asymmetrically distributed pulmonary patterns are as likely as diffuse nodular interstitial disease. 2) That death directly related to pulmonary Blastomycosis (or humane euthanasia due to pulmonary disease progression in the face of treatment) is statistically more likely with increased pulmonary disease at presentation. 3) The rate of radiographic resolution of pulmonary Blastomycosis depends on the combination of the lobar pattern and the degree of lobar involvement (not discussed here). The inclusion criteria were a) Blastomycosis confirmed by cytology, histology, or a combination of serology (AGID test) plus radiographic response to therapy, and b) an orthogonal pair of pre-treatment thoracic radiographs. Dogs with other known pulmonary diseases were excluded. A severity score (SS) was assigned to each lung lobe to assure numeric distinction of disease patterns independent of the degree of individual lobar disease. The patterns were assigned numeric values from most to least severe as: alveolar (A) (SS=1296), mass(es) (M) [$> 3.0\text{cm}$] (SS=216), large interstitial nodule(s) (INB) [0.5-2.9 cm] (SS=36), interstitial nodular (IN) [$<0.5\text{ cm}$] (SS=6), unstructured interstitial infiltrate (IU) (SS=1), and normal (N) (S=0). The distribution of the lobar pattern was quantified in 20% increments (consensus of LC and DF) based on the most severe pattern in each lobe. A Proportional Severity Index (PSI) was calculated [SS x % of that lobe affected] for each visit. Data were analyzed for statistical significance using one-way ANOVA and Chi-square techniques.

Results: One hundred twenty-nine cases fulfilled the inclusion criteria of which the dominant breeds were Labrador Retrievers (28%) and Golden Retrievers (15%); males plus neutered males exceeded females plus spayed females by 75/54. For this report, only the findings at initial diagnosis were analyzed. Two dogs had no radiographic evidence of pulmonary infiltrate except tracheobronchial lymphadenopathy, 20% of dogs had solely alveolar infiltrate in 1-3 lobes, 10% had solely lobar mass(es), and 16% of dogs had these patterns plus other disease (INB, IN or IU) that didn't involve one or more lobes. There was no significant difference in the number of dogs presenting with classic diffuse (all lobes) nodular interstitial disease (IN, INB) and those exhibiting other patterns (A, M, INB, IN, IU) with non-uniform interlobar distribution ($p=0.380$). The group (34%) of these dogs that died from Blastomycosis had higher $\sum\text{PSI}$ (summed lobar PSIs) than the group (66%) that lived ($p<0.05$).

Conclusions: Asymmetrically distributed and/or "atypical" pulmonary patterns are equally as likely as diffuse nodular interstitial patterns in canine Blastomycosis. This has the potential to result in delay of diagnosis and therapy because of similarities to other diseases. Severity of radiographically evident disease at initial presentation may serve as a prognostic tool to counsel owners in light of the cost and duration of therapy.

IMAGING FEATURES OF ORBITAL MYXOSARCOMATA IN DOGS. R. Dennis.
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Introduction: Myxosarcomas are rare tumours of fibroblastic origin which are characterised by the presence of abundant, intercellular mucinous material. They usually arise in the subcutis of the limbs or trunk, and there is only one case report of canine orbital myxosarcoma in the literature.¹

Methods: Clinical and imaging records were reviewed for dogs with a final diagnosis of orbital myxosarcoma. History, clinical signs, diagnostic imaging findings and pathological results were examined, with particular reference to diagnostic imaging features of this unusual tumour.

Results: Five dogs with a diagnosis of orbital myxosarcoma were found in a search of records from 1992-2005. These included two Labrador retrievers, one golden retriever and two medium/large crossbreds of 19kg and 30kg. The age ranged from 8 to 12 years and no sex predilection was noted. Clinical signs varied in duration from very recent to a twelve month history prior to referral. The main presenting sign was proptosis and protrusion of the third eyelid (5/5) and the severity of proptosis correlated with the time scale. Two dogs also showed soft, fluctuant swellings in the periorbital area. Ease of retropulsion was found to be normal or only mildly reduced. The condition was painless in 4 dogs but 1 dog developed pain on opening the mouth late in the course of the disease. Ultrasonography was performed in 4 cases and showed large, discrete pockets of fluid in the orbit. Radiography was performed in the dog with pain on opening the mouth and demonstrated osteolysis of the temporomandibular joint (TMJ). The 4 other dogs underwent MRI: in 3 the lesion consisted largely of loculated fluid with densely-enhancing surrounding tissue and more compact material near the TMJ; in the other dog the lesion was fairly solid overall. In all 4 cases the mass extended caudally from the orbit to involve the TMJ; osteolysis of the TMJ was severe in 1 case, equivocal in 1 case and not evident in 2. Osteolysis of the mandible and cranium also occurred in the dog with severe TMJ changes. In 4 dogs the orbital fluid was aspirated, and in all cases was thick, translucent and tenacious. Fine needle aspiration cytology in 3 cases was interpreted as being indicative of a sialocoele, and all 5 required surgical biopsy before the final diagnosis of myxosarcoma was made.

Discussion: Myxosarcoma is a rare tumour in dogs but may have a predilection for the orbital area. Affected dogs in this small series were all middle-aged to old and of medium to large size. The clinical signs are of progressive, relatively painless proptosis caused by fluid accumulation in orbital fascial planes. Involvement of the TMJ is common; in some cases osteolysis occurs, and this may be recognised radiographically. Orbital ultrasonography reveals fluid-filled pockets of variable size whilst MRI is helpful to show the extent of the lesion and to allow treatment planning. Aspiration of fluid and FNA cytology may initially be suggestive of salivary gland disease and definitive diagnosis seems to require surgical biopsy. It is important to distinguish myxosarcoma from salivary mucocoele, since the treatment and prognosis will differ.

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BRAIN IMAGING AND THE COGNITIVE PATHWAYS OF THE VETERINARY RADIOLOGIC DIAGNOSTIC. L.Massad, A.F.Rocha, F.T.Rocha, M.R.R.Massad, E.Massad, Discipline of Medical Informatics, University of São Paulo, R.Teodoro Sampaio 155, São Paulo, 05405-000, Brazil

Introduction: The cognitive pathways related to the diagnostic processes is still one of the challenges related to the medical practice (Rocha, 1992, Massad, 2003, Rocha et.al, 2004). Much ink (and magnetic media) has been spent on the discussions related to the ways by which doctors process information to reach a diagnostic. Recent brain imaging techniques and advances in neurosciences have laid some light on that discussion (Rocha et al, 2004). However, much is still to be done in this area, in particular in veterinary radiological diagnostic. A search in the international publications database under the keywords of *veterinary radiology AND diagnostic processes* did not resulted in any single paper on the subject. The purpose of this work is to analyze, by the use of brain mapping techniques, the cognitive processes related to the radiological diagnostic performance of a set of veterinary doctors.

Methods: We applied brain-mapping techniques described by Rocha et al. (2004, 2005) to a set of 30 female and 30 male veterinary doctors with three different levels of experience, namely, trainees (0-5 years since graduation), junior experts (5-10 years of graduation) and senior experts (>10 years of graduation). They were submitted to a clinical case and asked whether or not the clinical history required the complement of a radiology examination. Decision trees theory was also applied in order to trace the cognitive processes those subjects used to eventually reach the correct diagnostic. Emotional and rational processes related to the diagnostic moment were also mapped and quantified by the techniques used in the investigation.

Results: Our results are still preliminary but we have already some clues that there is an important gender difference in the cognitive processes related to the radiological diagnostic and a marked difference in the pathways doctors of distinct expertise levels apply to reach a final diagnostic.

Conclusions: As mentioned above, we are still processing the preliminary results but the techniques applied have proved very sensitive to determine with a reasonable reliability what are the brain processes related to the diagnostic processes veterinary doctors apply in their daily routine and practice.

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RELATIONSHIP OF INTESTINE DIAMETER & GAS TO OBSTRUCTION IN THE CAT. L Sisterman, R Kirby, J Klauer, WM Adams. University of Wisconsin-Madison, 53706

Introduction: Mechanical intestinal obstruction is a major differential diagnosis for cats presenting for acute or persistent vomiting. There is no tested index to predict likelihood of intestinal obstruction in the cat. Mensuration of intestinal diameter and subjective bowel gas pattern assessment were studied to evaluate their usefulness in predicting small intestinal obstruction in the cat.

Methods: Medical records and abdominal radiographs of cats seen at 2 hospitals over a 10 year period were studied. Cats were assigned to 1 of 4 groups: A) no history / clinical signs of intestinal disease; B) confirmed non-obstructive small intestinal disease; C) confirmed small intestinal linear foreign body; D) confirmed small intestinal obstruction, excluding linear foreign body. Disease was confirmed by laparotomy, endoscopy, biopsy or necropsy. Dorsoventral and lateromedial widths of the cranial vertebral end plates of the second and fifth lumbar vertebrae (LEP) and; maximum / minimum external intestinal diameters (SI) for identifiable portions of the bowel (duodenum, jejunum) were measured. Ratio of SI : LEP was then calculated. Amount and pattern of gas observed throughout the small intestines was subjectively recorded (< 25%, 25 – 50%, and >50% of small intestines containing gas). Statistical analysis was performed to evaluate whether the presence or absence of obstruction, and type of obstruction (linear foreign body versus non-linear mechanical), could be distinguished from normal or non-obstructed but diseased bowel by a SI : LEP ratio or other recorded intestinal variables.

Results: Seventy-three cats met inclusion criteria: 20 had no signs, 32 had non-obstructive bowel disease (LSA, lymphoplasmacytic enteritis), 11 were diagnosed with linear foreign bodies and 10 had non-linear intestinal obstruction. The jejunum / L2 ratio ranged from 0.85 – 4.15, and relationship between that ratio and type of disease was significant. Estimated probability of non-linear small bowel obstruction increased from 0.28 at a ratio of 2.0 to 0.71 at a ratio of 3.0. On evaluation of diameter of small intestine in millimeters rather than by bowel/vertebral end plate ratio, there was no significant correlation between maximum diameter of jejunum and disease. Small intestinal gas was observed in all cats, which was evident in > 50 % of small bowel in a quarter of the cats and in 25 – 50% of the bowel in a quarter of the cats. Small bowel gas was evident in < 25 % of the bowel in half the cats. There was no significant relationship between disease group and amount of bowel gas. A linear only, gas pattern was evident in 67% of cats, with a variety of other gas patterns occurring in the rest: linear + bubbles, linear + commas, linear +bubbles + commas, etc. Gas pattern was significantly related to disease group. Patterns containing comma-shaped gas were seen most frequently with linear foreign body.

Conclusion: Lumbar endplate to jejunum ratio is a more useful predictor of bowel obstruction in the cat than bowel mm measurement. This ratio, as it relates to bowel obstruction, is much greater than the published ratio for the dog. Amount of gas in feline small intestines did not relate to any specific disorder, however a gas pattern containing commas was related to linear foreign body.

Prevalence and Risk Factors for Hip Joint Degenerative Disease in Dogs in a Veterinary Teaching Clinic in Tanzania. Makungu, M., Bittegeko, S. B. P., and Mgasa, M.N.

Introduction: This study was carried out to determine the prevalence and risk factors for degenerative joint disease (DJD) of the hip in local and known breeds of dogs which are brought to Sokoine University of Agriculture (SUA) Veterinary Clinic in Tanzania. In Tanzania there isn't any radiological screening and selective breeding programs to control CHD and subsequently DJD of the hip.

Material and Methods: A total of 100 dogs were examined at SUA Veterinary Clinic. DJD and its major initial sign (Canine Hip Dysplasia) were diagnosed radiologically in a standard hip extended radiographic view after the animals have been given general anesthesia. A questionnaire was used to gather information on the possible risk factors associated with the presence of DJD. Other risk factors were determined from the radiological diagnosis.

Results: The prevalence of DJD was 45%. The prevalence was significantly higher ($P < 0.05$) in exotic breeds than in local breeds. The prevalence was higher in dogs with heavy body condition score compared to dogs with ideal, emaciated and thin body condition scores. On age category the prevalence was higher in dogs that were in older age category than in dogs that were in adult, juvenile and puppy age categories. Significant differences ($P < 0.05$) in the prevalence were observed between puppy and other age categories and between dogs with body condition score of heavy and thin. Further, the prevalence was significant ($P < 0.05$) higher in dogs with CHD than in dogs that were free from CHD. There was no significant difference ($P < 0.05$) in the prevalence of DJD of the hip between sexes, homebred and brought in dogs or in different feeding regimes. Dogs with large body weight, body lengths, and body width were in a significant risk ($P < 0.05$) of having DJD of the hip, indicating that, large breed dogs are more affected with DJD of the hip. Canine Hip Dysplasia (CHD) was found to be a significant ($P < 0.05$) risk factor for DJD of the hip. Local breeds dogs and dogs that were in a puppy age category were significantly ($P < 0.05$) less affected with DJD of the hip.

Discussion/Conclusions: This study concluded that, hip joint degenerative disease is frequent in Tanzanian dogs. Therefore, there is a necessity of introducing screening and breeding programs against CHD.

THE RADIOGRAPHIC QUARANTINE OF HIP AND ELBOW DYSPLASIA

OF GERMAN SHEPHERD IN NORTHEAST CHINA. Huijun XIONG, Haiqiang ZHANG, Hongwei LUO. College of Veterinary Medicine, South China Agricultural University, Wushan, Tianhe, Guangzhou 510642, P.R. CHINA(hjxiong@hotmail.com)

Introduction: Both canine hip dysplasia and elbow dysplasia are common, developmental orthopaedic diseases. The objective of the study was firstly to explore the epidemiology of canine hip and elbow dysplasia in northeast China.

Materials and Methods: The study was carried out on 651 one-year-old German shepherd dogs in northeast china (Peking areas and province of Liaoning). The used X-ray machine was Mikasa HF200. All Patients were anesthetized. The ventrodorsal hip extended position and lateral elbow position were taken. The radiographic signs seen in hip dysplasia and elbow dysplasia were graded according to their severity: mild(+), moderate(++), severe(+++). Subluxation of the femoral head could be assessed by Norberg's method.

Results: The incidence of mild(+), moderate(++), severe(+++) hip dysplasia and elbow dysplasia was 17.05%(111/651) and 1.99%(13/651), 9.52%(62/651) and 2.46%(16/651), 14.75%(96/651) and 9.06%(59/651) respectively. In 269 patients with positive hip dysplasia the incidence of elbow dysplasia was 13.75%(37/269), while the incidence of hip dysplasia in 88 patients with positive elbow dysplasia was 43.18%(38/88). Only 11 patients had both severe hip dysplasia and severe elbow dysplasia.

Discussion/Conclusions: The ventrodorsal extended hip and lateral elbow radiographic technique is the conventional method of confirming a diagnosis of canine hip and elbow dysplasia because of its availability and relatively low expense. Additional projections are recommended to rule out potential concurrent diseases. This study was the preliminary investigation of canine hip and elbow dysplasia in China. Further explorations remain to be made in the relationship between hip and elbow dysplasia.

Hind Leg Angles, Spondylosis and Arthrosis in the Chow Chow. Jens Arnbjerg, Mai Brit Toerngren. Institute for Small Animal Science, Royal Vet University, Copenhagen, DK

Introduction: It is been argued that unusual femoral neck angle is important for developing hip dysplasia, and a few reports on normal joint movement and mechanical power in the joints during movement are published, but no scientific supported research in the dog has shown the importance of the different joint angulations in the dog. However, it has been shown in horses that there is a higher risk of developing spavin if the dorsal hock angle is smaller. Many Chow Chows have a problem due to ruptured cranial cruciate ligament (CCL). The straight joint angles in the Chow Chow could be a reason for this.

Material & Methods 62 randomly chosen dogs in the Danish Chow Chow population were examined clinically and radiographed in a neutral standing position on a specially designed table with horizontal beam projection. Ventro-dorsal and latero-lateral radiographs were taken of the pelvic and the lumbar region. For comparison the hindleg angles were measured in 10 German Shepard dogs. The dorsal angle of the stifle and tarsus were measured using a goniometer, the joints were evaluated for arthrosis and the vertebral column for spondylosis. The appearance of spondylosis was compared with 48 German Shepard dogs. Dogs with severe arthrosis in the hip joints, oblique and incomplete projections were not included in the study. Therefore 49 Chow Chow dogs (18 male and 31 female) underwent the entire statistic procedure and evaluation.

Results: The femoro-tibial & tibio-tarsal joints were significant straighter in the Chow Chow (150° & 168°) than in the German Shepard (130° & 135°). The younger Chow Chow dogs had fewer arthrotic changes than older dogs, and the femoro-tibial joint angles were more straight than in those dogs showing arthrosis and lameness. The difference was significant: $t = 2.69$ $p < 0.0515$. The spondylosis started earlier in the Chow Chow than in the German Shepard and it was more severe. There was no sex difference in the Chow Chow whereas the female German Shepard had significant higher grade and number of vertebrae affected with Spondyloses than the male dogs. In the Chow Chow there were a significant higher numbers of transitional vertebrae in the lumbar-sacral area and a higher incidence of spondylosis in this area compared with the German Shepard which had more spondylosis in the Thoraco-Lumbal area.

Discussion: In the horse it has been shown, that the straighter the hock angle is, the less risk for developing spavin. The result of this study supports the same idea that a straight position is the best conformation for dogs. The hind leg joint angulation seems to have some impact on the arthrosis in the stifle of the Chow Chow dogs, as it is shown that the straighter the joints, the less arthrosis and lameness. It can be argued that the way Chow Chow dogs are kept do not reflect the power on the CCL, but on the other hand even the minimal strength of the CCL in the Chow Chow produces enough energy to injure the ligaments.

Conclusion: This material shows that in Chow Chows the straight angle in the hock and in the stifle is not related to the arthrosis of these joints. The more open the angles, the less problem were found.

RADIOGRAPHIC PRESENTATION OF THE EQUINE SACROILIAC REGION

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Introduction: Equine sacroiliac (SI) joint injuries are frustrating clinical problems because of the inability to accurately diagnose and treat pelvic lameness. Radiography is part of the diagnostic imaging, however, to the author's knowledge, the radiographic appearance of the SI region is poorly described. We present a simple technique to obtain radiographs in the anesthetized horse and describe the variability of the radiographic appearance of the sacroiliac region.

Methods: Seventy-nine horses (46 males and 33 females), presented at the horse clinic for inconclusive lameness or back pain underwent radiography of the pelvis after bone scintigraphy. Seventy-five patients were warmblood horses and 4 were purebred. The mean age was 10.3 years (range 4-20 years) and the mean bodyweight was 558 kg (305700 kg). Radiography of the pelvis was performed under general anaesthesia in dorsal recumbency with the legs held in flexed position. The x-ray beam was centred on the midline at the height of the tubera sacrales. An exposure of 96 kVp / 500 mAs with an exposure time of five seconds was chosen, during which the horse was ventilated several times in order to blur the internal abdominal organs. A Fuji CR system was used and the radiographs were archived on an eFilm fusion server. The images were evaluated three times by the first author using MERGE eFilm workstation 2.1 and Adobe Photoshop CS. Evaluation included the visibility of individual structures, shape and size of the bony components of the SI region.

Results: Adequate blurring was achieved in 77/79 radiographs. In two horses remaining superimposition of intestinal structures made pelvic assessment impossible. Five horses showed transitional or hemi-transitional vertebrae. In all horses a large variation of the shape of the sacral wings and their articulation with the transverse processes of L6 and the relation of the sacrum to the ileum was observed. There was a significant difference between males and females concerning the width of the sacral wings with significantly narrower wings in females. In 73 horses the caudal border of the sacral wings was visible and 56 horses showed osteophyte formation at their caudal border. In males the caudal osteophytes were significantly larger. There was a large variation in the length of the sixth lumbar vertebra and also in the size of the intervertebral disc space of L6 and S1. In seven horses no intervertebral disc space was visible. There was no or low correlation ($r < 0.370$) between the individual measurements and age or body weight.

Discussion/ Conclusions: The ventilation-induced blurring technique without linear tomography is a simple approach that results in a delineation of the structures of the SI region in most horses. The radiographic appearance of these structures, especially the sacral wings, showed a large variability. Interestingly, the larger sacral wings and bony proliferations at the caudal aspect were commonly observed features and their size showed highly significant correlation with gender, but not with age or bodyweight. The clinical significance is at present still unclear. A large number of anomalies were additionally found, such as fusion of vertebral bodies and transitional vertebrae. Computed radiography was indispensable for the radiographic interpretation due to the possibility to change imaging parameters (eg. image frequencies, edge enhancement) during evaluation.

RADIOGRAPHIC AND ULTRASONOGRAPHIC EXAMINATION OF SYNOVIAL INTERVERTEBRAL JOINTS OF THE EQUINE CERVICAL SPINE. F. Audigié, D. Didierlaurent, D. Carnicer, J.-M. Denoix. CIRALE, National Veterinary School of Alfort, Goustranville, 14430 FRANCE.

Introduction/Purpose: The cervical synovial intervertebral articulations (SIVA or facet joints) are evaluated in the standing horse using most frequently only lateral radiographic projections. Recently, the normal ultrasonographic appearance of cervical SIVA has been presented but little information exists about the interest of ultrasonography in the assessment of cervical injuries. Thus, the purpose of this study is to describe ultrasonographic findings in horses with cervical SIVA abnormalities on lateral radiographs and to compare these findings with those identified on lateral and oblique radiographic projections.

Methods: 35 horses (ranging in age from 1 to 13 years old) were diagnosed with cervical SIVA injuries based on lateral radiographs. Two radiographic oblique projections (left dorsal-right ventral and right dorsal-left ventral oblique views) centered on the abnormal SIVA were also performed in the standing horse to allow a separate evaluation of the left and right SIVA. Ultrasonographic examination of the corresponding left and right SIVA was conducted with a 7.5 MHz convex linear probe applied directly on the clipped skin.

Results: Abnormalities were detected on lateral radiographs from the SIVA between the 2nd (C2) and 3rd (C3) cervical vertebrae to those between C7 and T1. All these altered SIVA had an abnormal ultrasonographic appearance. Oblique projections and ultrasonographic scans allowed to determine whether the SIVA were uni- or bilaterally affected, which could not be determined using only lateral projections. Oblique projections did not visualize the caudal part of the C6-C7 SIVA in large horses and the C7-T1 SIVA in all horses due to their superimposition with the shoulder area. In contrast, these SIVA were clearly evaluated ultrasonographically. Different kinds of ultrasonographic abnormalities were identified and well correlated with radiographic alterations. Hypertrophic articular processes were easily identified on transverse scans. These scans allowed an assessment of the dorsoventral hypertrophy and of the lateromedial one which could not be evaluated on lateral radiographs. Ultrasonography was highly sensitive to any peri-articular bone remodelling and osteophyte formation. Osteochondral fragments and fractures of the cranial or caudal articular processes were also diagnosed on ultrasound scans. Nevertheless, the spatial representation of the fracture lines were more easily achieved using a combination of lateral and oblique radiographic projections. But the main advantage of ultrasonography was its capability to visualize soft tissue lesions. Thickening of the synovial membrane and articular capsule of the SIVA were observed. Acute and chronic synovitis with fluid distension and echogenic spots floating in the synovial fluid compatible with fibrin or cartilaginous debris were also identified.

Discussion/Conclusions: The limitations of ultrasonographic assessment are the lack of information on deep bone architectural changes and are caused by the cervical SIVA conformation which prevents an evaluation of their medioventral part and of the articular cartilage and subchondral bone. Nevertheless the diagnosis and documentation of cervical SIVA injuries can considerably be improved by the combined use of ultrasonography and radiography. Ultrasonography represents also a mean of evaluating C6-C7 and C7-T1 SIVA whose radiographic examination is difficult to perform with a portable x-ray machine.

RADIOGRAPHIC STUDIES ON COENUROSIS IN GOATS. J.C. Lekharu, D. Gogoi and D.K. Lahon.

Introduction: Coenurosis (gid) in goats is one of the dreaded diseases and widely prevalent in Assam. Diagnosis of this disease on clinical symptoms is not enough for confirmation. Radiography aids in proper and accurate localization of the cyst in the brain. Thus an attempt was made to study the radiographic changes occurring in goat with gid.

Methods: In this study, 36 goats affected with gid were used for plain and contrast radiography. Out of these, 18 animals were used for plain radiography and arteriography, other 18 animals for venography. The common carotid and the angularis oculi vein were cannulated for infusion of contrast materials. The radiographs were made during the last phase of injection. The exposure factors used were 8 to 10 MAS, 60 to 70 KVP and 90 cm FFD.

Results: The common radiographic features on plain radiographs were thinness, discontinuity and rarefaction of the parietal bone and a clear radiolucent area were visible in almost all the plain radiographs (Fig. 1). Arteriography revealed narrowing, disruption, leakage and stagnation of contrast material, displacement, ill-defined and poorly visualized arterial network. Complete avascularity around the space occupying lesion was also observed (Fig. 2.). Venography revealed narrowing, disruption and significant disturbance in the venous drainage in the brain area of the affected goats (Fig.3).

Discussion: In plain radiography, the thinness and the extent of discontinuity of the parietal bone might be due to pressure atrophy, severity and chronicity of the cases. Rarefaction might be due to the constant pressure by the cyst in the brain as well as in the bone. (Soulsby 1965; Targari et al., 1987). Displacements of blood vessels were indirect signs of tumor. This might be the contributing factor for the diagnosis of space occupying lesion. Poorly visualization and a state of almost complete avascular lesion might be due to the pressure exerted by the space occupying lesions. Venography of affected animals showed significant narrowing, disruption or filling defect and poor visualization of the vessels of the brain which might be due to increase intracranial pressure, which causes slowing down the intracranial blood flow and it might be due to constriction of muscular venules. Disruption or filling defect and absence of the venous supply in the brain area indicated some obstruction in the venous circulation and it might be due to space occupying lesion.

Conclusions: The plain and contrast radiography of affected goats could give a diagnostic clue for locating space occupying lesion.

THE USE OF ULTRASONOGRAPHY TO GUIDE THERAPY IN FRACTURE DELAYED UNIONS M. Risselada, H. Van Bree, M. Kramer, P. Verleyen, J.H. Saunders
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Introduction/Purpose: After a fracture delayed union is diagnosed, the decision must be made if surgery is necessary or whether the delayed union can be managed conservatively. A previous study has shown the high correlation of power Doppler ultrasonography (US) with the amount of vascularization at non-union sites.¹ The aim of the present study was to investigate the usefulness of US (B-mode and power Doppler) in distinguishing delayed unions that required intervention from those that would heal without intervention.

Methods: A one-year prospective clinical study was performed on patients returning for follow up after long bone fractures. Radiographs and US (B-mode and power Doppler) were performed as part of the standard imaging protocol. A previously described protocol was used to describe the B-mode images at the fracture site,² and a previously described scoring system was used to quantify the power Doppler signals.³ Patients that were suspected of having delayed unions, as diagnosed by lack of healing after a prolonged time were included. The delayed union was managed conservatively if vascularization was present at the fracture site.

Results: Three dogs with delayed union were identified: a Dobermann with a humeral fracture (case 1), a American Staffordshire Terrier with a femoral fracture (case 2) and a Bull Terrier with a tibial fracture (case 3). Diagnosis of delayed union was made at 88 days for case 1 (score 1.55, stage II); at 73 days for case 2 (score 1.02, stage II) and 52 days for case 3 (score 0, stage III). The 2 cases with vascularization present at the fracture site were managed conservatively and went on to full healing at 146 days for case 1 and at 98 days for case 2. No vascularization was evident at the fracture site in the fourth case (52 days postoperatively). Surgery was performed on this case. On subsequent follow up, vascularization was evident at the fracture site and the fracture healed without complications.

Discussion/Conclusions: Ability to diagnose when conservative management can be advised for delayed unions would be economically interesting. In the present study 2 out of 3 cases with delayed union were vascularized as diagnosed on power Doppler US and went on to full healing without intervention. Power Doppler US therefore shows promises in predicting if a delayed union can still progress to healing. However, future studies on a larger study group are necessary to validate these findings.

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CHANGES IN ECHOCARDIOGRAPHIC VARIABLES OF LEFT VENTRICULAR SIZE AND FUNCTION IN A MODEL OF CANINE NORMOVOLEMIC ANEMIA

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Introduction: In South Africa the most important cause of anemia in dogs is the hemoprotozoal disease, canine babesiosis; here a particularly virulent strain, *Babesia canis rossi*, is prevalent. Myocardial changes have also been documented in canine babesiosis. The objective of this study was to document changes in echocardiographic variables of left ventricular size and function by non invasive means in healthy, conscious dogs during experimentally-induced acute normovolemic anemia. This study was developed with the purpose of providing baseline information in order to further investigate the pathophysiology, and more specifically the cardiac changes, in dogs suffering from canine babesiosis-induced anemia.

Methods: The study group comprised of 11 mature healthy Beagle dogs that weighed between 9 and 15 kg. Severe normovolemic anemia was induced over a 3-4 day period by serial bleeding while maintaining normovolemia by autotransfusing plasma and infusing crystalloids. The dogs were then allowed to recover. Pre-anemic [mean hematocrit (Hct) 46.7%, standard deviation (SD) 2.4%] echocardiographic variables of left ventricular size [end-systolic and end-diastolic ventricular diameters and volumes, as well as left atrial size] and performance [Fractional shortening, ejection fraction, stroke volume, cardiac output, cardiac index, and heart rate] were compared to those in the severely [mean Hct 15.3 %, SD 1.1%], moderately [Hct mean 24.7%, SD 1.5%] and mildly [mean Hct 33.5%, SD 2.5%] anemic states, and between the anemic states. Variables were statistically compared using repeated measures analysis of variance.

Results: Apart from slight exercise intolerance, the dogs showed no side effects from the anemia induction. With the exceptions of end diastolic volume and left atrial size, there was a statistically significant ($p < 0.05$) increase in all variables in the severely anemic state versus the pre-anemic and the mild and moderate anaemic states.

Discussion: In accordance with previous invasive models, a hyperdynamic state of the left ventricle develops in response to experimentally induced acute canine normovolemic anemia in the conscious dog. We hypothesize that this is most likely as a result of a reduction in afterload from reduced blood viscosity. Echocardiography shows promise as a non-invasive technique of evaluating the cardiac changes in dogs suffering from canine babesiosis and other causes of anemia.

ULTRASONOGRAPHIC CHARACTERISTICS OF INTRATHORACIC MASS LESIONS IN DOGS AND CATS. K.M. Hittmair, A. Guija de Arespacochaga, I. Schwendenwein Department for Diagnostic Procedures, University of Veterinary Medicine A-1210 Vienna, Austria

Purpose: Mass lesions of the mediastinum, pleural space, and lungs are most commonly detected on thoracic radiographs. Pleural effusion often hides intrathoracic lesions, while it greatly enhances ultrasonographic imaging. Ultrasound-guided biopsy techniques assist in accurate needle placement and supply rewarding tissue specimens. The purpose of this study was to describe the ultrasonographic appearance of intrathoracic mass lesions and to distinguish between neoplastic and non-neoplastic masses.

Methods: Thoracic ultrasonography was performed on 47 patients (34 dogs, 13 cats). Thoracic radiographs with suspected mass lesions and/or pleural effusion were taken previously. Ultrasound-guided fine needle aspiration biopsy was performed in 32 animals, tissue core biopsies in 3 patients. Diagnosis was confirmed at necropsy in 13 patients or during surgery (2). More than one diagnostic procedure was applied in some patients.

Results: Pulmonary mass lesions were found in 15 of 47 cases (32%). Thirteen of 15 masses were neoplastic with 4 bronchogenic carcinoma and 5 adenocarcinomas, appearing as homogeneous, hypoechoic well-demarcated masses with hyperechoic focal inclusions, representing trapped air. Two lung masses were diagnosed as malignant histiocytosis (heterogeneous with mixed echogenicity). Other neoplasms included 1 metastasizing scirrhous carcinoma (heterogeneous, poorly defined margins, mixed echogenicity) and 1 spindle cell sarcoma (metastases, hypoechoic 5 mm nodules). Pulmonary non-neoplastic masses included lung consolidation following pneumonia in 1 dog (hypoechoic, poorly margined lung area, hyperechoic gas inclusions) and a similar image in 1 dog with atelectasis after thoracocentesis. Mediastinal masses were diagnosed in 28 of 47 patients (60%). Lymphomas (9) were hypoechoic, nodular, well-demarcated and commonly located in the cranial mediastinum. Thymomas (8) were heterogeneous, echogenic with cystic lesions. Mediastinal mesothelioma was confirmed in 2 patients (nodular hypoechoic lesions). Malignant histiocytosis was determined in hilar and sternal lymph nodes in 3 dogs (heterogeneous with mixed echogenicity). Hemangiosarcoma (2) of the heart base showed medium echogenicity and clear margins. Other non-neoplastic mediastinal masses included abscesses in 3 cats (hyperechoic capsule, echogenic particles) and 1 idiopathic cyst-like structure. Mass lesions of the thoracic wall included 2 chondrosarcomas and 1 osteosarcoma (hyperechoic, heterogeneous, well-demarcated) and 1 granuloma with focal hyperechoic thickening of the chest wall and intercostal space. Pleural space masses were seen in 2 dogs, caused by pyogranulomatous inflammation from actinomyces (1) and nocardiosis (1). Both pleural spaces contained echogenic fluid with hyperechoic nodular masses.

Conclusions: Thoracic ultrasonography is valuable to confirm radiographic findings and is facilitated by pleural fluid. While most mass lesions have characteristic images, ultrasound examinations of intrathoracic masses should always be accompanied by fine needle aspiration or tissue core biopsy techniques.

ULTRASONOGRAPHIC EXAMINATION OF SMALL ORGANS IN THE CANINE ABDOMEN. E. Schreurs¹, N. Rademacher³, D. Nitzl³, O. Taeymans¹, I. Putcuyp¹, L. Duchateau², J.H. Saunders¹ ¹Medical Imaging and ²Physiology and Biometrics, Faculty of Veterinary Medicine, Ghent University, Belgium. ³Diagnostic Imaging and Radio-Oncology, Vetsuisse Faculty, University of Zürich, Switzerland.

Introduction/Purpose: Ultrasonography (US) is the technique of reference for the examination of the abdomen in dogs and cats. However, there are few data about the influencing factors in the US examination of the abdomen. The aim of this study was to assess the value of US for the visualization of small organs in the canine abdomen.

Methods: Hundred complete abdominal US examinations were performed for this prospective study. Fifty examinations were performed at the Ghent University on a GE Logiq 7 US machine with a microconvex 6-9 MHz transducer and a linear 7-12 MHz matrix transducer. Fifty other examinations were performed at the University of Zürich on an Philips 5000 HDI US machine with a curvilinear 5-8 MHz transducer and a linear 5-12 MHz transducer. The signalment, body condition score (1=very thin to 5=obese), difficulty for imaging (inherent to the dog, contents of gastro-intestinal (GI) tract, grade 1 to 5) and compliance of the patient (grade 1 to 5) were recorded. The observers were asked to image the pylorus, duodenal papilla, ureters (left and right), pancreas (left lobe, body, right lobe), adrenal glands (left and right), lymph nodes (medial iliac, jejunal), uterus (cervix, left and right horns) and ovaries (left and right). The percentage of visualization of the different organs was recorded and related to the dog's parameters and institutes based on the logistic regression model.

Results: The pylorus was seen in 64% of the patients, the duodenal papilla in 42%, the ureters in 1%, the left pancreatic lobe in 56%, the body of the pancreas in 60%, the right pancreatic lobe in 87%, the left adrenal gland in 91%, the right adrenal gland in 86%, the medial iliac lymph nodes in 54% and the jejunal lymph nodes in 51%. In 59% of the entire bitches the cervix of the uterus was visible, the horns of the uterus in 29%, the left ovary in 69% and the right ovary in 65%. The two institutes differ significantly with respect to pylorus (Ghent 94%-Zürich 33%, $P<0.001$), pancreas in general (Ghent 59%-Zürich 76%, $P=0.048$) and lymph nodes (Ghent 76%-Zürich 29%, $P<0.001$). There was a significant negative influence on the imaging of the pancreas and the duodenal papilla by increased body weight ($P=0.023$ and $P=0.007$, respectively) and filled GI tract ($P=0.015$ and $P=0.002$, respectively). However, these factors and a young age ($P=0.001$) had a significant positive influence on the imaging of the lymph nodes. A high body condition score enhanced the imaging of the right adrenal gland ($P=0.011$). A good inherent image quality positively influenced the visualization of the left pancreatic lobe ($P=0.002$). The compliance of the dog had no influence.

Discussion/Conclusions: Not all small abdominal organs are consistently imaged during a routine US examination. There is a difference between institutes in scanning some of these organs during a routine US examination. Body weight and contents of the GI tract are the factors that influence the visibility of most small organs, while age, body condition score and inherent image quality are minor influencing factors.

DETECTION OF INSULINOMAS IN DOGS WITH ENDOSCOPIC ULTRASOUND

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Introduction/Purpose: Canine insulinomas are challenging to detect with transabdominal ultrasound (US) either due to their small size, location or poor visualization due to overlying, gas-filled intestines. In a recent report, only 5 of 14 insulinomas in dogs were detected with transabdominal ultrasound.¹ In humans, endoscopic ultrasound (EUS) can detect a higher percentage of pancreatic tumors as well as metastases of gastrinomas and insulinomas compared to US, CT and MRI.² Endoscopic ultrasound (EUS) can also be used to examine the upper abdomen of dogs.³ Advantages of EUS imaging of organs in close proximity to the stomach include decreased penetration depth and marked reduction of artifacts due to bowel gas and improved resolution. The purpose of this study is to describe the detection of insulinomas using endoscopic ultrasound in dogs.

Methods: Ten dogs with suspected insulinoma based on clinical signs and laboratory tests were examined between May 2003 and October 2005 at the University of Bern, Switzerland. Clinical signs included weakness, collapse and seizures as well as hypoglycemia and elevated blood insulin levels. The dogs' body weights ranged from 3.8 – 30.0 kg and there were 8 females and 2 males in the group. Each dog was examined transabdominally in the conscious state with a 7.5MHz curved array transducer (Aloka Prosound 5500, Aloka Europa, Hamburg, Germany). Endoscopic ultrasound examinations were performed under general anesthesia using a 7.5MHz curved array transducer on an Olympus GF-UC140P-AL5 gastroscope (Olympus, Hamburg, Germany).

Results: Nine of the ten dogs had insulinomas confirmed surgically and histologically. In 7 of the 9 dogs hypoechoic nodules between 8-14mm were detected in the pancreas with EUS that were not identified transabdominally. In one dog, a 6mm nodule was identified in the region of the pancreatic body, an EUS examination was not performed and the diagnosis was confirmed at surgery. In another dog, both the transabdominal and EUS examination were negative, insulin levels were high with normal glucose values and the cause was never determined. In a third dog, no lesion was detected in either transabdominal or EUS but an insulinoma at the tip of the right pancreatic limb was found and removed surgically.

Conclusions: EUS was superior for detecting insulinomas in dogs compared to transabdominal ultrasound. The EUS examination was not limited by the presence of intestinal gas, the dog's size, a deep thoracic confirmation or lack of cooperation such as movement and panting. EUS allows a complete examination of the left pancreatic limb and body as well as the proximal portion of the right pancreatic limb. Lesions in the distal right pancreas, however, may be missed with EUS.

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ULTRASONOGRAPHIC PARAMETERS OF THE NORMAL FERRET GASTROINTESTINAL TRACT. J. Basseches, P.A Frank, C.A. Brown, S. Hernandez-Divers, J.N. Gladden, D. Jimenez-Martinez, G.H. Wilson,. University of Georgia CVM, Georgia, 30602

Introduction: Abdominal ultrasound is established as a non-invasive, efficient means of examining the gastrointestinal (GI) tract which also enables guided sampling of intra-abdominal tissues. Ferrets are subject to many primary GI tract disorders and to the best of the authors' knowledge, no standardized sonographic measurements of GI wall thickness or the appearance of normal wall layering are currently available in ferrets. Studies have been performed which characterize the sonographic appearance of GI disorders in humans, dogs and, to a lesser degree, cats, but not ferrets. Primary GI diseases of ferrets often alter wall thickness and architecture of involved segments, as has been described from gross and histopathological evaluation. The purpose of this study was to establish the characteristic sonographic appearance of the normal ferret GI tract. The long term goal of this study is to facilitate ultrasonographic detection of GI alterations in disease states and lay the ground work for future studies which aim to characterize the appearance of specific diseases of the ferret GI tract.

Materials and Methods: The GI tract of 20 clinically normal ferrets was evaluated sonographically by one ultrasonographer. Six adult intact certified healthy research ferrets (3 male, 3 female) were obtained for this study. Other ferrets included client owned animals. Owners filled out a questionnaire on the health and husbandry of their pet. Ferrets received a physical examination. Ferrets with clinical signs referable to the GI tract or any systemic disease were not included in the study. After a 3-4 hour fast, client owned ferrets were sedated with 0.02 mg/kg acepromazine maleate (Ft. Dodge Ind., Ft. Dodge, IA) and research ferrets were anesthetized with isoflurane. Three transverse and three sagittal measurements of wall thickness were obtained from the lesser curvature of the stomach, duodenum, a random segment of the jejunum and the descending colon. Gross examination and histopathology of the GI tract was performed in two research ferrets (one male, one female) for confirmation of normal findings and comparison of gross and ultrasonographic measurements. Isolated segments of the GI tract from one ferret were scanned in a water bath to determine reproducibility of in vivo and in vitro findings. The entire abdomen of each ferret was scanned to rule out sonographic evidence of disease. Statistics performed were descriptive, including mean and standard deviation of GI wall thicknesses.

Results: Ultrasonographic mensuration of mean wall thickness (mm +/- SD) for gastrointestinal segments of all ferrets is as follows: stomach: 1.80 ± 0.52 ; duodenum: 1.59 ± 0.19 ; jejunum: 1.58 ± 0.21 ; colon: 1.37 ± 0.28 . Although peristalsis was seen in all segments of the GI tract, it was least commonly present in the colon. The characteristic appearance of five wall layers was identified in all segments of the GI tract in larger ferrets (over 1.25 kg); however, identification of all 5 layers was inconsistent in smaller ferrets and frequently only 3 layers were visualized.

Conclusions: Sonography is an effective, non-invasive diagnostic method for assessing the normal ferret gastrointestinal tract.

EFFECT OF ULTRASOUND BEAM ANGLE ON EQUINE ARTICULAR CARTILAGE THICKNESS MEASUREMENTS. P.Y. Barthez, R.J. Bais; Division of Diagnostic Imaging, Department of Small Animals, Veterinary Faculty, Utrecht University, Yalelaan 10, NL-3508 TD, Utrecht, The Netherlands.

Introduction/Purpose: The speed of ultrasound in articular cartilage has been shown to be higher than the reference speed used by ultrasound units to calculate distance and to be anisotropic. This results in an erroneous placement of the reflective bone-cartilage interface due to refraction and distance calculation error. The purpose of this study was to determine if variation in the ultrasound beam angle relative to surface cartilage would affect cartilage thickness measurements performed with B-mode grey scale ultrasonography.

Materials and Methods: Transverse sections of 6 fresh equine second phalanges were obtained from necropsy and imaged in a water bath using a 5-10 MHz linear transducer. Ultrasonographic images of the proximal articular cartilage were obtained adjacent to the section and with the ultrasound plane parallel to the section. Static images were acquired for all 6 bone specimens with an angle of 90°, 60°, 45°, and 30° between the ultrasound beam and the articular cartilage. Digital photography of the bone specimen adjacent to a ruler were also obtained. Proximal articular cartilage thickness was measured on ultrasonographic images and on the bone specimen photographs at the same level using ImageJ software. Ultrasonographic measurements were performed 3 times. A linear regression model was used to compare articular cartilage thickness measured on digital photography and on ultrasonographic images using different ultrasound beam angle.

Results: Mean \pm SD cartilage thickness was 1.82 ± 0.35 mm on bone specimens, 1.72 ± 0.29 with a 90° angle, 1.99 ± 0.34 with 60°, 2.06 ± 0.34 with 45° and 2.3 ± 0.38 with 30°. There was a significant difference between macroscopic measurements and ultrasonographic measurements performed with ultrasound angles at 30, 45, and 60°. There was a significant increase in cartilage thickness when the ultrasound beam angle decreased ($R^2 = 0.969$).

Conclusion: Cartilage thickness measured on ultrasonographic images varies with the ultrasound beam angle due to refraction and anisotropy of ultrasound speed in articular cartilage.

COLLATERAL LIGAMENTS INJURIES OF THE EQUINE HOCK DIAGNOSED BY ULTRASONOGRAPHY: RETROSPECTIVE STUDY OF 11 CASES. G. Bolen *, V. De Busscher *, V. Busoni **Medical Imaging Section – Department of Clinical Sciences – Faculty of Veterinary Medicine – University of Liège – 4000 Liège – Belgium

Introduction/Purpose: Lameness due to pain localized in the hock region is frequent. A high number of lesions of the equine tarsus are diagnosed with radiography. However collateral ligament damage requires an ultrasonographic or a magnetic resonance imaging examination to be assessed. The objective of this retrospective study was to determine and describe diagnostic findings in horses with hock collateral ligament injuries diagnosed by ultrasonography.

Methods: Hospital records were reviewed to select the horses that underwent to ultrasonographic examination of the hock. Horses with an ultrasonographic diagnosis of collateral ligament damage were used for this study. Medical records, radiographs and ultrasonographic findings were reviewed. History, clinical signs and diagnostic findings were collected.

Results: Forty-seven horses had undergone tarsus ultrasonography during the period 2000-2005. Eleven horses out of the 47 had an ultrasonographic diagnosis of collateral ligament damage. All horses had unilateral hindlimb lameness (mild to severe) and tibio-tarsal synovial effusion. One horse presented an injury of the medial collateral ligament, 9 had lateral collateral ligament damage and one had both collateral ligaments affected. Two horses had avulsion fractures associated with lateral collateral ligament damage. Medial injuries involved the short collateral ligament in one case and the long collateral ligament in another case. Lateral injuries included damage of the short lateral collateral ligament in 9 horses and damage of both short and long collateral ligaments in 1 horse. Ultrasonographic findings were thickening, hypoechogenicity and loss of fiber pattern of the affected ligament. Affected ligaments were diffusely hypoechoic or showed localised hypoechoic lesions mostly in their distal portion. Avulsion fragments were seen as hyperechoic bony structures giving acoustic shadowing. Associated radiographic signs included roughening of the talar surface. One horse had talo-calcaneal arthropathy and one horse had long plantar ligament desmopathy associated with collateral ligament injury.

Discussion/Conclusions: Ultrasonography allows the assessment of the collateral ligaments of the hock, the identification of the affected bundle in case of desmopathy and the evaluation of the extent of the damage. Injury of the lateral collateral ligament and damage to the short bundle were more common in the cases evaluated retrospectively in this study. Ultrasonography of the hock is indicated in all horses with hock lameness, tibio-tarsal synovitis and negative radiographic examination.

ULTRASONOGRAPHIC FINDINGS IN 55 HORSES SUSPECTED OF TARSAL JOINT

PATHOLOGY. J. H. Saunders, M. Hoegaerts, K. Vanderperren, T. De Clercq, O. Taeymans
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Introduction/Purpose: Ultrasonography (US) has been demonstrated to be useful for the diagnosis of soft tissue injuries in the tarsal joint.^{1,2} The aim of this study was to describe the US findings in 55 horses suspected of tarsal joint pathology.

Methods: From December 2003 to November 2005, an US examination was performed in 55 horses suspected of tarsal joint pathology. Age ranged from 2 to 18 years (mean = 7.8 years, median = 10 years). The study included 11 stallions, 17 geldings and 27 mares. A complete US examination was performed in four steps (dorsal, lateral, medial and plantar approaches). The mean duration of the examination was 25 minutes.

Results: The main disease process involved the dorsal aspect of the joint in 17/55 (31%) horses, the lateral aspect in 7/55 (13%) horses, the medial aspect in 12/55 (22%) horses and the plantar aspect in 24/55 (43%) horses. In 5 horses, a significant disease process affected more than one anatomical structure. On the dorsal aspect of the joint, 15 horses showed a synovitis/capsulitis of the tarsocrural joint. Seven of these horses had osteochondrosis. Two horses had a tendonitis of the EDLo from which 1 had also a tenosynovitis and the other one a tarsocrural joint effusion. On the lateral aspect of the joint, the deep part of the collateral ligament was affected in 6 horses (4 desmitis, 2 rupture). In 2 of these horses, there was also a tendonitis/tenosynovitis of the tendon of the lateral digital extensor muscle and an avulsion fracture of the malleolus. One horse had an abscess at the level of the malleolus and cellulitis. On the medial aspect of the joint, 8 horses showed a lesion of the collateral ligament (1 superficial part, 6 deep part, 1 both parts) with a concurrent fracture of the medial malleolus in one of these horses. Three horses had a tenosynovitis of the M. flexor medialis and 1 horse a subcutaneous abscess and periostitis. On the plantar aspect of the joint, 7 horses had a subcutaneous bursitis, 7 horses a dislocation of the superficial digital flexor tendon (SDFT) (6 lateral, 1 medial – all with an intertendinous bursitis – 3 with a tendonitis of the SDFT), 3 horses a tendonitis of the SDFT and/or desmitis of the medial retinaculum, 2 horses an intertendinous bursitis, 1 horse a rupture of the SDFT, 1 horse a tendonitis of the gastrocnemius muscle and 1 horse a chronic osteomyelitis (with sequestrum) of the calcaneus. Two horses had a tenosynovitis of the tarsal sheath.

Discussion/Conclusions: US showed abnormalities in all the 55 horses. Nearly all soft tissue structures were affected which means that a careful and complete examination is required when scanning the tarsal joint.

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PROGNOSTIC RELEVANCE OF ULTRASONOGRAPHICAL FINDINGS IN RACE HORSES WITH TENDON INJURIES IN TURKEY: PRELIMINARY RESULTS.

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Introduction: Tendon injuries are one of the most encountered problems that let horses drop out from racing for a long period of time or even forever. Treatment of tendon injuries is very time consuming and expensive and the return to previous performance is not guaranteed.

Ultrasonography provides an objective diagnostic means for the characterization of tendon lesions initially and during the healing process. The aim of this study was to assess the prognostic relevance of ultrasonographical findings in injured tendons by evaluating the properties of the alterations regarding the clinical outcome and performance of the horse after injury.

Materials and Methods: 178 race horses with suspected flexor tendon injury were examined clinically and ultrasonographically. In 124 horses alterations were detected in the tendinous and peritendinous tissues and were included in the study. The horses were followed up for 2-9 years. Clinical outcome was determined by return to racing, time out of racing and number of winnings after injury based on control examinations, owners' report and the official racing records of the Jockey Club. The horses were divided into groups on the basis of breed, age, sex, body weight and height. The influence of the severity of the lesion as a whole, the localization of the lesion in-between the tendon, the type and echogenicity of the lesion, tendon thickening and the presence of peritendinous alterations on clinical outcome were evaluated. Statistical analysis was performed using Chi Square, Kruskal Wallis and Mann-Witney tests.

Results: Breed distribution of the injured horses was 49.2% (n=61) Arabians and 50.8% (n=63) Thoroughbreds. Body weight had a significant effect on the presence of a distinct lesion. However, breed, age, sex, body weight and height of the horse had no significant effect on the severity of the lesion, the affected tendon, the localization of the lesion in-between the tendon, the type and echogenicity of the lesion, tendon thickening and the presence of peritendinous alterations. As severe tendon lesions were diagnosed in only 2 horses, these cases were excluded. The overall rate of return to racing was 71.3%. 43.4% won at least 2 races (mean 10.8±8.8), 22.1% raced without success and, 27.9% retired. 57.4% of mild tendonitis without lesion and with/without peritendinous alterations, 38.6% of mild lesions, and 38.8% moderate lesions returned to racing with 2 and more winnings, and had an average time out of racing for 9.2±5.9, 9.9±7.0 and 8.1±6.9 months respectively. Severity of the lesion, the affected tendon, the localization of the lesion in-between the tendon, the type and echogenicity of the lesion, tendon thickening and the presence of peritendinous alterations had no statistically significant influence on clinical outcome.

Conclusions: In contrast to some other studies, the results of this study suggest that the physical properties of the horse seem not to influence the return rate to racing. The type and properties of the injury determined ultrasonographically doesn't appear to facilitate a prognostic statement about clinical outcome and performance after injury, as well. Cases with severe lesions should be included in further investigations. But, in view of a relative high recovery and winning rate and short time out of racing, owners could be encouraged to adequately treat their race horses with mild or moderate tendonitis.

CLINICAL UTILITY OF THE RIGHT LATERAL INTERCOSTAL ULTRASOUND SCAN PLANE. E.L. Brinkman, D.S. Biller, L.J. Armbrust. Kansas State University, Kansas, 66506.

Introduction: A thorough sonographic examination of the abdomen must include evaluation of the entire liver, portal hilus, right kidney, right adrenal gland, pancreas, and duodenum. These structures are often not fully visible from a subcostal approach. The right lateral intercostal approach is valuable in evaluation of these structures.

Methods: Multiple case examples are provided which demonstrate the sonographic anatomy via the right intercostal approach. Other cases are included to demonstrate indications for this approach. Patient preparation involved clipping the hair over the abdomen, from the xiphoid caudally and dorsally to the level of the hypaxial musculature. Based on patient conformation, the hair was clipped further cranially and dorsally to allow for the intercostal approach. In each patient, the abdomen was scanned routinely in dorsal recumbency. Following the routine examination, the patients were placed in either left lateral or dorsal recumbency. The transducer was oriented in the transverse and sagittal planes from the 8th-12th intercostal spaces depending on patient conformation.

Results: Patients in which the right intercostal approach proved most useful included large/giant breed dogs, deep-chested dogs, patients with gas distention of the stomach, duodenum, and colon, and patients with microhepatia, abdominal effusion, and abdominal pain. Structures visible via the right intercostal approach included right lateral, medial, and caudate lobes of the liver, gall bladder, caudal vena cava, aorta, portal vein at the hilus of the liver, common bile duct, hepatic artery, right kidney, right adrenal gland, pylorus, duodenum, pancreas, hepatic and pancreaticoduodenal lymph nodes. Diseases that were identified via the right intercostal approach include obstructive and infiltrative diseases of the stomach and duodenum, diffuse and focal liver disease, obstruction of the common bile duct, pancreatic inflammation and neoplasia, right renal disease, right adrenal disease, lymphadenopathy, and vascular diseases such as portosystemic shunts and caudal vena cava thrombosis. This approach is also useful for percutaneous biopsy of the liver and right kidney.

Discussion: Based on the anatomic structures visible via the right intercostal ultrasound scan plane, numerous diseases may be better evaluated via this approach, especially in large, deep-chested dogs.

HEPATIC TRANSIT TIME OF THE SIGNAL ENHANCER SONOVUE IN THE DOG.

Antje Hause, Ingmar Kiefer, Doreen Succow, Beate Bosch, Gerhard Oechtering

Introduction: The detection of hepatic lesions constitutes still a major problem in spite of some improvement by the use of signal enhancers. As the success of therapy depends critically on the time when the neoplasia is discovered better diagnostics would be extremely helpful. A possible way is the measurement of signal enhancer transit times because it can be assumed that they are shortened by the formation of vessel shunts in the case of neoplasias. It is the aim of the present work to establish reference values for the dog.

Materials and Methods: 24 male and female dogs of different races with healthy liver status (assessed by sonography and laboratory investigations) were investigated. All animals were pre-medicated with Diazepam/Polamivet and kept under anaesthesia by Isofluran. To induce an apnoe phase during the actual investigation the patients were hyperventilated for some minutes. The apnoe phase was upheld for up to 60 seconds during the examination which was necessary for the generation of "time intensity curves" (TIC). The investigations were carried out using a GE Logiq 9 with convex 4C transducer and for smaller patients additionally with a linear L9 transducer. The echo signal enhancer (0.1 ml/kg body mass) was intravenously injected into the v. cephalica antebrachii. Before and after the injection the vessel was flushed with 10 ml physiological saline. To enable the comparison the blood flow velocities in the aorta abdominalis and the liver veins were determined before and after the actual investigation. The arrival of the enhancer in the liver arteries and the time span until it reached the liver veins were measured.

Results: The mean time for the enhancer Sonvue to reach the liver arteries was 8.5 s (range 7-9s) and it took on average 15 s (14-17 s) until it was seen in the liver veins. The calculated hepatic transit time is thus 6.5 s (5-7 s). There is little influence of blood flow velocity in the aorta abdominalis on the transit time. In patients which no circulatory changes were found before anaesthesia similar transit times could be measured even when there were differences up to 20 cm/s in the aorta blood flow velocity. The blood flow velocity was, however, still within the physiological range. With animals which showed significant circulatory depression before anaesthesia the aorta flow was clearly reduced. This was reflected also in strongly delayed appearance of the enhancer in the liver arteries. The hepatic transit time is, however, independent of a circulatory depression within the reference range.

Conclusions: The hepatic transit time as obtained as the time span between the arrival of the enhancer in the liver arteries and its appearance in the veins appears to be independent of circulation. For the healthy dog the values lie in the range of 7 – 7 s. Further investigations will clarify whether changes linked to various liver diseases as described for humans can also be found in dogs.

SONOGRAPHY ESTIMATION OF GALLBLADDER VOLUME IN NORMAL ADULT DOGS. H. G. Heng¹, R.H. Wrigley: Department of Environmental and Radiological Health Sciences, College of Veterinary Medicine & Biomedical Sciences, Colorado State University, Fort Collins, CO 80523-1601, USA

Introduction: The establishment of a normal baseline of a range of fasting canine gallbladder volume (GBV) would be useful in veterinary clinical sonography. GBV prior to cholestatic illness in icteric dogs is frequently unknown. The purpose of this study was to establish the GBV of dogs and investigate its relationship to body weight and age.

Materials and Methods: Sonographic records of all dogs at Colorado State University Veterinary Teaching Hospital between 1994 and 2000 were reviewed retrospectively. Adult dogs (>1 year) were selected for inclusion in this study if they had a normal total bilirubin level (< 0.3 mg/dl) and normal sonography of the hepatobiliary system with sonographic estimation of GBV. The gallbladder lumen was traced with an electronic cursor at luminal-mucosal interface at its longest dimension. Estimation of the GBV was performed using Simpson volumetric formula of the ultrasound machine. Dogs were expected to be fasted for 12 hours prior to the sonographic examination. The age, body weight, breed and estimated GBV were recorded. The relationship between the estimated GBV and body weight, and the estimated GBV and age were determined by plotting the regression lines and calculating the correlation coefficient, R^2 according to size categories by breed.

RESULTS: There were a total of 406 animals included in this study which were represented by 80 breeds. There were a total of 27 breeds (109 dogs) in the small breed size category, 24 breeds (101 dogs) in the medium breed size category, and 31 breeds (196 dogs) in the large/giant breed size category. The mean (ml) and upper value of the 95% confidence interval (ml) for small, medium and large/giant breeds were 10.48, 17.67, 24.57 and 35.28, 51.39 and 67.39 respectively. There was a significant statistical relationship between the estimated GBV and body weight of small breed dogs. There was no significant relationship between the estimated GBV and body weight for medium and large/giant breed, and estimated GBV and age for all breed categories.

DISCUSSION: Human studies showed a progressive increase of GBV with age (6 – 19 years) (Palasciano et al., 1989). However we did not recognized any correlation between the estimated GBV and age of the dogs. This is expected as we only includes adult dogs (>1 year of age) in this study. Although the recommended fasting period prior to sonography was 12 hours as in humans, we suspect there was some non compliance to the recommended fasting period in some dogs. Inconsistence fast length could have lead to the wide range of estimated GBV in this study. We suspect some of the smallest estimated GBV could be attributed to shorter time of fasting. As a result of these variables, we propose that canine patients' GBV is best evaluated after a 12 hour fast and compared to the upper value of the 95% confidence interval of GBV found in this study.

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USE OF CONTRAST HARMONIC ULTRASOUND FOR THE CHARACTERIZATION OF FOCAL LESIONS OF THE SPLEEN: 21 CASES. Rossi F, Vignoli M, Leone VF, Terragni R. Clinica Veterinaria dell'Orologio, Via Gramsci ¼ - 40037 - Sasso Marconi – Bologna (Italy)

Purpose: The purpose of this study was to evaluate if CHU is useful to investigate the perfusion and can increase the characterization of focal splenic lesions, in order to differentiate between benign and malignant lesions and identify specific perfusion pattern.

Methods: 19 dogs and 2 cats with focal lesions of the spleen were included. The fundamental ultrasonographic appearance of the lesion varied from hypo- to hyperechoic to complex type. Between 0,5 and 1 ml of a second generation us contrast medium (Sonovue®, Bracco) was injected in the cephalic vein. A contrast-tuned imaging system (CnTI, Megas Esatune, Esaote) was used to image the flow of the contrast into the lesion and in the surrounding spleen. The recorded videotapes were subjectively reviewed and analyzed by quantitative measurement using a commercial software. Lesions were analyzed considering following criteria: 1. perfusion in the lesion during wash in, peak and wash out phases compared with surrounding spleen 2. progression of the enhancement (centripetal, centrifugal, homogeneous) 3. presence and appearance of feeding vessels 4. time to peak (lesion vs spleen) 5. wash in and wash out slope. 15 dog underwent splenectomy and histology followed. In 6 cases (all benign cases), cytology of the lesion was performed and the animals were rechecked by ultrasound to look for an eventual change of the lesion.

Results: 2 dogs were excluded from the study because, despite histology, a definitive diagnosis could not be reached. 10 malignant (3 hemangiosarcomas, 1 undifferentiated sarcoma, 3 lymphosarcomas, 1 malignant histiocytosis, 1 malignant fibrous histiocytoma, 1 mastocytoma), 1 benign fibrous histiocytoma, 1 haematoma and other 7 benign splenic lesions were diagnosed. Hemangiosarcomas and the undifferentiated sarcoma were characterized by homogeneous anechoic (non-perfused) areas with highly vascularized surrounding parenchyma. Thin septae of hyperechoic tissue entered the anechoic areas with a sharp demarcation between these two different parts. The malignant fibrous histiocytoma was a homogeneous and low perfused lesion with an early wash in and wash out in comparison with the normal spleen. Lymphosarcomas and malignant histiocytosis had a shorter time to peak in comparison to the spleen, were hypoechoic at peak and in the wash out phase with an early wash out. A fine net of thin uniformly distributed vessel was present. In the wash out phase, small hypoechoic round areas were evident. The haematoma was a homogeneous hypoechoic area with low perfusion in all phases. 7 benign lesions had similar wash in and wash out to the spleen, 2 of them were briefly hyperechoic in the wash in phase but became quickly homogeneous with the surrounding parenchyma. The benign histiocytoma was the only clearly hyperperfused lesion in comparison with the spleen. Multiple vessels were seen in the central part of the lesion.

Conclusions: CHU is a suitable method to investigate the perfusion and helps the characterization of focal splenic lesions. All malignant tumours were hypoechoic in the wash out phase, hyperperfused areas were associated only with benign lesions. Hemangiosarcomas and lymphosarcomas showed specific perfusion pattern.

ULTRASONOGRAPHIC AND PATHOLOGIC CORRELATION OF CORRUGATED SMALL INTESTINE CAUSED BY LYMPHOMA IN TWO DOGS. T. Daikokuya, T. Miyabayashi, Y. Kagawa, Y. Sasaki, S. Sato, T. Takehara, The Institute of Veterinary Education & Advanced Technology, North Lab, Senri NT animal hospital, Tawaradai animal hospital, Japan

Introduction: In a retrospective report (Moon, et al), a corrugated appearance of the small intestinal loop were associated with pancreatitis, neoplasia, peritonitis, and bowel wall ischemia. We have encountered two dogs with corrugated appearance of the small intestine. Both dogs had biopsy of the lesion that was confirmed to be lymphoma. In this report, we will present histologic and ultrasonographic correlation.

Case Report: A 13-year-old, male, mixed dog was presented with anorexia and vomiting for 4 to 5 days and diarrhea 5 days ago. On abdominal radiographs, no significant finding was noted. The dog was referred for ultrasonographic examination. A corrugated appearance of the duodenum was noted. Regional lymph nodes were enlarged. A fine needle aspirate was performed, but the diagnosis was not confirmed. Laparoscopy was performed, and the histologic finding was confirmed as lymphoma. The dog was euthanized after 1 month due to poor body condition. Necropsy results showed a undulated appearance of the duodenum, jejunum and ileum. Histologically, it was due to lymphoma. A 1-year-old, male, dachshund was presented with diarrhea for 2 weeks and intermittent vomiting. On abdominal radiographs, no significant finding was noted. On ultrasonographic examination, corrugated appearances of small intestines were noted. Regional lymph nodes were enlarged. A fine needle aspirate did not yield a diagnosis. A wedge biopsy of ileocolic junction revealed lymphoma. The dog died 9 months later due to recurrence of lymphoma.

Discussion: In these patients, a corrugated appearance was associated with infiltration of lymphoma in submucosal, muscular, and serosal layers. In this report, uneven infiltration or thickening was histologically confirmed to cause corrugated appearance. According to the previous report (Moon, et al), peritonitis and pancreatitis caused corrugated appearance of small intestinal loops due to spasm. Corrugated appearance can be caused by a linear foreign body. In authors' experience, these three sets of abnormalities cause the corrugated appearance of small intestinal loops. When regional lymph nodes are enlarged, lymphoma should be considered to be the most likely diagnosis. When fine needle aspirates do not yield the diagnosis, biopsy should be performed to confirm the diagnosis.

Reference: Moon ML, Biller DS, Armbrust LJ. Ultrasonographic appearance and etiology of corrugated small intestine. Vet Radiol Ultrasound, vol.44, No.2,199-203(2003)

ASSESSMENT OF POST-OPERATIVE ULTRASONOGRAPHIC APPEARANCE OF UNCOMPLICATED ENTEROTOMY OR ENTERECTOMY SITES IN DOGS. A.R. Matthews, D. Penninck, C. Webster. Cummings School of Veterinary Medicine at Tufts University, North Grafton, MA, 01536.

Introduction: Ultrasonography (US) is a useful tool in diagnosing intestinal disorders, but its place in evaluating surgical dehiscence has yet to be determined. The purpose of the study is to evaluate the role of US in assessing the integrity and appearance of small intestinal surgery sites following uneventful enterotomy or enterectomy. This information will provide useful reference guidelines needed to distinguish normal post-operative (PO) findings from intestinal dehiscence.

Methods: Thirteen client-owned dogs that presented to the Foster Hospital for Small Animals for surgical intervention for intestinal foreign bodies or intussusceptions were included in the study. All dogs underwent a pre-operative abdominal US, followed by serial US on the 1st, 3rd, 6th, and 10th day PO. Any PO US finding not resolved by the 10th day necessitated an additional US after day 20 PO. Documented US features included intestinal wall thickness and length of the enterotomy or enterectomy site, echogenicity of mesenteric fat, amount of free gas and abdominal effusion, and gastrointestinal motility. Pancreatic and regional lymph node changes were included when observed. Pre-operative radiographs, when available, were also evaluated.

Results: Enterotomies were visualized in 3/6 dogs while enterectomies were noted in 7/7 dogs. For documented surgery sites (10/13), intestinal wall layering was initially absent for 6-10 days PO. At the final US examination, bowel wall layering remained focally altered in enterotomies, while a focal area of absent wall layering with adjacent altered wall layering was noted at anastomosis sites. Intestinal wall thickening was maximal between days 1-3 PO (median 0.7 cm for enterotomies and 1.2 cm for enterectomies) with the exception of 1 enterectomy. Effusion localized to the surgery site (2/3 enterotomies; 3/7 enterectomies) was greatest at day 3 and progressively decreased in all dogs (fully resolved in 3/5 dogs by day 6 PO). Focally hyperechoic mesenteric fat at the surgery site was noted up to 6-10 days PO. Abdominal effusion and free abdominal gas were seen in all 13 dogs. Abdominal effusion had resolved in 11/13 dogs and free abdominal gas had resolved in 12/13 dogs by day 10 PO. Diffusely hyperechoic mesenteric fat was noted in 5/13 dogs and had resolved by day 3 PO. Pancreatic and lymph node changes were generally mild and inconsistent.

Conclusions: Enterectomies were more easily identified than enterotomies, most likely due to the extent of the surgical site. Partial return of normal layering and decreased thickening of the intestinal wall as well as decreased echogenicity of local mesenteric fat were documented between 3-10 days PO. Effusion localized to the surgery site was present in 5/10 dogs. The volume was maximal at day 3 and was noted to decrease over subsequent examinations. Increased echogenicity of mesenteric fat, free abdominal gas and abdominal effusion did not significantly hamper evaluation of the intestinal surgery site.

THE MORPHOLOGICAL SIGNIFICANCE OF ULTRASONOGRAPHIC INTESTINAL HYPERECHOIC STRIATIONS IN DOGS.

J. Sutherland-Smith, D.G. Penninck, J.H. Keating, C.R.L. Webster. Cummings School of Veterinary Medicine at Tufts University (TCSVM), North Grafton, MA 01536.

Introduction/Purpose: Ultrasound of the gastrointestinal tract has become a routine part of the diagnostic investigation of acute and chronic diarrhea and vomiting in the dog. The aim of this study was to evaluate the morphologic significance of the ultrasonographic (US) presence of intestinal hyperechoic mucosal striations (HMS) in dogs. HMS are defined as multiple fine hyperechoic striations within the mucosal layer that extend between the mucosa-lumen interface towards the submucosal layer.

Methods: In a retrospective study, 23 dogs with the US feature of HMS and an endoscopic or surgical biopsy of the intestinal tract were identified using the ultrasound log and histopathology databases of TCSVM between 1999 and 2006. Ultrasonographic images and videotapes, radiographs, histopathology specimens and medical records were reviewed. On ultrasound, small intestinal thickness, wall layering, mucosal echogenicity and pattern, the location and distribution of the changes, presence of corrugation, mesenteric lymph node size and echogenicity, changes in the mesentery and the presence of abdominal effusion were assessed. Histopathology specimens were evaluated for the severity of lacteal dilatation (scale of 0-4), location of lacteal dilatation (villus, submucosa, mural or serosal), inflammation associated with the lymphatic vessels, inflammatory infiltration type and severity (scale of 0-3) and other villus or crypt changes.

Results: Ninety six percent of dogs with HMS had histopathologic evidence of lacteal dilatation. Commonly associated US findings included mild jejunal wall thickening (96%), mild duodenal wall thickening (78%), mucosal speckles (70%) and small or moderate volume abdominal effusion (87%). The changes were diffuse (70%) or multifocal (30%) and did not cause loss of wall layering, with the exception of one severe lipogranuloma that presented as an intestinal mass. Lymphadenopathy was identified in 9% of dogs. Endoscopic biopsies in 13/14 dogs had mild to moderate villus lacteal dilatation and the 9 surgical biopsies had moderate to severe dilatation. The mild (61%) or moderate (30%) inflammation had variable numbers and combinations of cells, including eosinophils (65%), plasma cells (61%), lymphocytes (57%) and neutrophils (30%). A single dog had disseminated villus histiocytic sarcoma. The serum biochemistry and clinical signs were consistent with protein-losing enteropathy in 78% of dogs.

Conclusions: There is a strong correlation between intestinal HMS and dilatation of the central lacteals on histopathology. Diseases responsible for this change included inflammatory enteropathies, lymphangiectasia and histiocytic sarcoma. Additional prospective studies are recommended to further assess the significance of this feature in various canine intestinal diseases.

THREE-DIMENSIONAL COLOR DOPPLER ULTRASONOGRAPHY OF THE KIDNEY VASCULATURE AND BLOOD FLOW ANALYSIS IN DOG. M. Molazem*

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PURPOSE: In some diagnostic indications such as kidney transplantation and kidney tumor, it is necessary to provide detailed characterization of the renal vasculature which can be used to produce equivalent invasive techniques such as renal angiography to determine the presence, location and blood flow pattern of the kidney. The purpose of this study was to assess the feasibility, reproducibility, and accuracy of three-dimensional color Doppler (3DCD) ultrasonography (US) in evaluation of kidney vasculature pattern in dogs and also estimating the blood flow velocity parameters by using pulsed Doppler analysis.

MATERIALS AND METHODS: A total of 12 normal German Shepherd dogs underwent 3DCD imaging of the kidney vasculature with a GE Voluson 730-Pro ultrasonography machine with a 5-12 MHz linear array three-dimensional (3D) transducer. They were put into deep anesthesia and attached to respiratory ventilator apparatus to avoid respiratory motion by artificial apnea during 3DCDUS scanning. Image acquisition was performed as a volume of data with nearly immediate reconstruction and simultaneous display of sectional anatomy in three orthogonal planes—sagittal plane, transverse or coronal plane, or any arbitrary oblique plane and also finally a 360 degree rotating 3D plane (figure 1). Images were evaluated for gross anatomical visualization and character of the renal, segmented, and interlobular artery and veins. For each mentioned blood vessels, peak systolic velocity (PSV), mean velocity (MnV), resistive index (RI), end diastolic velocity (EDV), and pulsatility index (PI) was obtained by pulsed-waved Doppler ultrasonography.

RESULTS: Three-dimensional US allowed visualization of the renal and segmented artery and vein in all planes in 100%, and interlobular artery and vein were seen in 83.3% of the animals. The 3DCDUS was not able to discriminate arcuate and very small vessels. No statistically significant variation was demonstrated in different sexes or weights. Mean distance of visible flow to the capsule was 2.8 ± 0.8 mm. The mean obtained diameter of the renal, segmented, and interlobular arteries were: 0.27 ± 0.031 , 0.18 ± 0.01 , and 0.13 ± 0.02 and for veins they were: 0.60 ± 0.04 , 0.65 ± 0.08 , and 0.49 ± 0.07 , respectively. The 3DCDUS image reconstruction required less than three minutes and it can be performed in real-time 3D too. There was no significant difference between left and right kidney parameters. PSV, MnV, RI, EDV, and PI for renal artery were: 20.74 ± 1.59 , 13.12 ± 1.39 , 0.40 ± 0.05 , 10.73 ± 1.12 , and 0.61 ± 0.06 ; for segmented artery they were: 16.73 ± 2.62 , 10.83 ± 2.16 , 0.57 ± 0.19 , 8.11 ± 1.58 , and 0.69 ± 0.16 ; and for interlobular artery they were: 8.94 ± 0.78 , 5.02 ± 1.06 , 0.53 ± 0.06 , 5.13 ± 0.78 , and 0.63 ± 0.12 , respectively.

DISCUSSION: To our knowledge, this may be the first clinical series in which 3DCDUS was used for kidney in dogs. Color Doppler three-dimensional US appears to be clinically feasible and easy to perform. Added anatomic pattern of kidney vasculature, may also allow better depiction of a probable tumor or investigation of a transplanted kidney. Also because of full availability to all scanned slices of the vessels, measuring the diameters of the vessels seems to be more accurate. The 3DUS method also gives us extremely useful images for teaching and other diagnosing purposes. The 3D image presentation can be easily demonstrated using the rotating 3D animation too (figure2).

KIDNEY-TO-AORTA RATIO: A NEW ULTRASOGRAPHIC METHOD IN ESTIMATING RENAL SIZE IN DOGS. M.A.d'Anjou, A. Maréchal, M. Moreau, G. Beaugard, K. Alexander, Department of Clinical Sciences, Faculty of Veterinary Medicine, University of Montreal, St-Hyacinthe, Quebec, Canada J2S 7C6.

INTRO/PURPOSE: Size is an important parameter in evaluating organ dysfunction, including renal disease. Absolute ultrasonographic measurements cannot be used as an accurate indication of renal size in dogs, due to the great variability in body conformation. Additionally, large variation can occur in renal size in dogs of similar weight. Consequently, renal size is often subjectively evaluated on ultrasound. The purpose of this study was to compare the diameter of the aorta as a landmark and to the maximal kidney length in dogs with no evidence of clinically-relevant renal disease.

METHOD: Maximal left and right renal length and maximal aortic luminal diameter (longitudinal and transverse planes, just caudal to the renal arteries) were measured twice in 20 dogs by 2 experienced ultrasonographers, in order to evaluate intra- and inter-observer repeatability. Bland-Altman plots supported by Spearman correlation and Wilcoxon tests were used. Measurement repeatability was high. No systematic bias or difference between measurements was statistically observed, especially when using the longitudinal plane to measure the aorta. Measurements of the kidneys (length) and aorta (maximal diameter on longitudinal images) were then prospectively obtained in 92 mature dogs, presented to the Veterinary Teaching Hospital, with ultrasonographically normal kidneys. These dogs were clinically normal, were diagnosed with a non-renal disease and/or had normal blood or urine tests, when available. Dogs of different breeds and sizes [estimated mean weight: < 10 kg (n=22), 10-20 kg (n=16), > 20 kg (n=54)] were included. Renal length-to-aorta ratios (R/Ao) of the right versus left kidneys were compared within groups using a Wilcoxon test. The average left and right R/Ao ratios were compared between size categories using a Kruskal-Wallis test.

RESULTS: Left and right R/Ao ratios were not statistically different within dogs. Averaged R/Ao ratios were significantly higher in small dogs (< 10 kg; 7.9 +/- 0.7) when compared to dogs of the 2 other categories (7.1 +/- 0.8 & 7.1 +/- 0.9) (p<0.001). Confidence limits (95%) for averaged R/Ao ratios were 6.4-9.4 (< 10 kg), 5.5-8.7 (10-20 kg) and 5.2-8.9 (> 20 kg).

DISCUSSION/CONCLUSION: Maximal renal length and aortic luminal diameter can be ultrasonographically measured with repeatability in dogs. In this population of dogs with no evidence of clinically relevant renal disease, ratios were higher in small breeds (< 10 kg) compared to dogs of other categories. Based on these results, R/Ao ratios should be considered abnormal if < **6.5** or > **9.4** in small dogs (< 10 kg) and if < **5.3** or > **8.9** in all other categories of dogs (\geq 10 kg). This selected population was meant to reflect the population of dogs encountered in a referral practice. The impact of systemic arterial pressure or blood volume on the ratios was not assessed and undetected renal disease could not be ruled out in all patients. Despite these limitations, R/Ao ratio could be useful in estimating renal size in dogs. However, further studies are required to establish the clinical usefulness of this new measurement in the evaluation of kidneys in dogs with renal disease.

SONOGRAPHICALLY DETERMINED KIDNEY CIRCULATION PARAMETERS IN DOGS UNDER THE INFLUENCE OF SELECTED ANAESTHESIA PROTOCOLS.

Ingmar Kiefer, Michaela Alef, Kristianna Becker, Peter Himmelsbach, Antje Hause, Gerhard Oechtering

Introduction: Similarly to human medicine there are various attempts also with cats and dogs to assess kidney alterations via blood flow patterns and circulation indices. The significance of the circulation status is always mentioned but its influence is often underestimated. It is the aim of the present study on one hand to simulate and assess this influence by various anaesthesia protocols and on the other hand to evaluate the impact of anaesthesia on kidney circulation.

Materials and Methods: Four different anaesthesia regimes were investigated in 90 clinically healthy dogs (foxhounds and beagles): group 1: Acepromazin/l-Methadon, group 2: Diazepam/l-Methadon, group 3: Medetomidin/l-Methadon, group 4: Propofol. PW-Doppler flow patterns in the Arteria arcuata were measured and resistance and pulsatility indices determined. These values were obtained both without anaesthesia and in five minute intervals up to 30 minutes after the begin of anaesthesia. Additionally heart beat frequency, IBP and pulse oxymetry during the examination were automatically recorded. The investigations were carried out using an Acuson Sequoia equipped with a 8 MHz convex transducer.

Results: In group 1 (acepromazine/l-methadone) a transient increase of the mean arterial blood pressure is seen within five minutes after induction of anaesthesia which is reduced, however, to the initial value after 10 minutes and remains essentially constant for the rest of the treatment. RI and PI behave identically in this group: after a small initial decrease during the first five minutes both parameters increase steeply. This rise is very pronounced up to about 15 minutes and flattens then significantly until the end of the test period after 30 minutes. The values correspond to those found with vessel stenosis. In group 2 (diazepam/l-methadone) and group 4 (Propofol) RI and PI behave in a comparable manner. The values lie essentially within the reference range for untreated dogs, also the flow patterns are hardly different. The animals in group 3 (medetomidine/l-methadone) exhibit already after five minutes massive changes of all measured parameters. Mean arterial blood pressure increases at first twofold and decreases afterwards slowly but without reaching again the initial value. RI and PI drop after five minutes dramatically and increase afterwards only slowly but without even approaching the reference range of not anaesthetised animals. The spectral patterns with a loss of pulsatility and massively delayed acceleration indicate a post-stenotic kidney circulation.

Conclusions: The data show clearly that different anaesthesia protocols exert distinct influences on sonographically accessible perfusion parameters in the kidney. While the combinations diazepam/l-methadone and propofol result only in small deviations from the normal behaviour, distinct alterations are noted with l-methadone/acepromazine and l-methadone/medetomidine. These findings require, of course, clinical confirmation and clinical relevance is therefore still unclear. Nevertheless, the results reported indicate that the use of the latter combinations in renal risk patients has to be treated with caution. The data show furthermore that the circulation status of the patients has significant impact on RI and PI. The applicability of these parameters has therefore to be judged critically.

CONTRAST-ENHANCED ULTRASONOGRAPHY OF THE CANINE KIDNEY.

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INTRODUCTION: Contrast-enhanced ultrasonography is used as a means of visualizing vascularity and tissue perfusion. Renal contrast-enhanced ultrasonography has been described in human patients for the evaluation of neoplasia, trauma, arterial stenosis, infarction and transplant rejection. Similar potential applications are found in small animal medicine; an optimized technique for evaluation will improve the clinical utility of the technique. This prospective study aimed to establish an optimum dose rate for evaluation of vascularity and perfusion of the canine kidney with a second generation contrast agent (Optison[®]), using power Doppler and harmonic imaging.

METHODS: 10 clinically normal dogs were randomly assigned to one of two groups. Group 1 was imaged using power Doppler, and group 2 was imaged using a low mechanical index pulse inversion harmonic technique. A constant window of the left kidney was scanned and fixed technical parameters used within each group. Four increasing doses of contrast (1 μ l/kg, 2.5 μ l/kg, 5 μ l/kg and 10 μ l/kg) were administered intravenously as a bolus. Scans were recorded on videotape and images digitized for computer analysis. Cumulative histograms of the color level or brightness within regions of interest (ROI) in the cortex and medulla, representing blood volume, were constructed. Time to peak enhancement and area under the cumulative histogram (AUC) were calculated. For subjective evaluation a radiologist viewed still peak enhancement images paired with pre-contrast images, in a random order, and graded the degree of enhancement and the conspicuity of the renal vessels. Paired and unpaired t-tests were used to measure within and between group differences.

RESULTS: A similar time course was seen in all dogs. A sharp rise in cortical enhancement was followed by a more gradual increase in medullary enhancement, with a significant difference in the time to peak between cortex and medulla, but no significant difference in time to peak between doses. Contrast enhancement increased logarithmically with increasing dose using both techniques. Differences between pre- and post-contrast images were significant for all doses. Enhancement of the cortex was significantly greater at 5 μ l/kg and 10 μ l/kg than at lower doses both objectively and subjectively using both techniques. Perfusion of the medulla could best be seen using harmonic imaging, with 10 μ l being significantly better than other doses. Conspicuity of the interlobar and arcuate vessels was subjectively significantly better at the lowest dose (1 μ l) using power Doppler, and was significantly better using power Doppler than harmonics.

CONCLUSION: Technical parameters for contrast-enhanced ultrasonography of the canine kidney should be varied according to the clinical question. For evaluation of the vascular architecture, contrast-enhanced power Doppler at lower doses is advantageous, whereas tissue perfusion in the peripheral cortex and medulla is best evaluated using harmonic imaging and higher doses of contrast.

HYPOECHOIC SUBCAPSULAR THICKENING IN FELINE KIDNEYS: ASSOCIATION WITH MALIGNANT LYMPHOMA. A. Valdes-Martinez, W. Mai, University of Pennsylvania, PA, 19104.

Introduction: The ultrasonographic diagnosis of kidney disease can be difficult because of the multiple and non-specific changes in the renal architecture that different disease processes may cause. Feline renal malignant lymphoma is one of these conditions that can cause various ultrasonographic changes, making its diagnosis challenging. This retrospective case-control study describes an ultrasonographic finding of the feline kidney that consists of a hypoechoic subcapsular thickening. The aim of this study was to establish the correlation between the presence of this ultrasound finding and a diagnosis of renal lymphoma in feline patients.

Methods: The medical records of the Veterinary Hospital of the University of Pennsylvania were searched for cats that underwent ultrasound examination and fine needle aspirate and/or biopsy of one or both kidneys over a period of 6 years (1999-2005). Ultrasound images of the kidneys were reviewed by a radiologist blinded to the patients' history and final diagnosis. The images were classified depending on the presence or absence of a hypoechoic subcapsular thickening (HSCT). Final diagnosis was obtained for each case, based on review of the cyto- or histo-pathologic reports, or necropsy reports. A Chi-squared test of independence was performed to compare the proportion of lymphoma in animals with the HSCT versus the group of animals without the sign. A p value of less than 0.05 was considered significant.

Results: One hundred and twelve cats were found. Three cases were discarded due to absence of adequate images. HSCT was present in 28 cases. It appeared as a crescent shape thickening (75%) or as a circumferential, rim-like thickening (25%). Internal echoes were sometimes present, and no distal acoustic enhancement was associated. Seventeen of these 28 cats were diagnosed with renal lymphoma (5 multicentric and 12 renal alone), while the remaining 11 had a different diagnosis (2 other neoplasia, 2 open with gastrointestinal lymphoma, 3 inflammatory disease and 4 with no abnormalities). Among the 17 cats with lymphoma, the HSCT was the only change aside from renomegaly. Eighty-one cases had no evidence of HSCT, of which 12 were diagnosed with renal lymphoma (10 multicentric and 2 renal alone), 2 with carcinoma and the remaining 67 cases had necrotic, inflammatory changes or an open diagnosis. The proportion of renal lymphoma was higher in the group with the HSCT than in the group without (60.7% and 14.8% respectively, odds ratio 8.9), and the difference was statistically significant ($p < 0.0000001$). The positive predictive value of HSCT for lymphoma was 60.7% and the negative predictive value was 85.2%.

Conclusion: This study indicates that the presence of hypoechoic subcapsular thickening in feline kidneys is associated with renal lymphoma. This thickening is most often crescent shape.

ULTRASONOGRAPHIC DETERMINATION OF THE RELATIVE KIDNEY SIZE IN THE DOG. W. M. Wagner. Faculty of Veterinary Science, University of Pretoria, Private Bag X04, Onderstepoort 0110, South Africa.

Introduction/Purpose: Ultrasonographic evaluation of the urinary tract has become a routine procedure in veterinary medicine. Ultrasound imaging is usually one of the first studies performed to assess the kidneys because important anatomic information can be obtained. Despite this, up to date, there is no reliable method for determining normal kidney size by ultrasonographic measurements in the dog. Therefore, kidney size is judged primarily by subjective evaluation in dogs. Linear kidney measurements in the cat are more useful because there is less variation in body size. On radiographs, this dilemma has been avoided by giving quantitative measurements, correlating the kidney size to the animal's body size, hence using the animal itself as reference. This results in a reliable normal range of kidney size in the dog from 2.5 to 3.5 times the length of L2 measured on a ventrodorsal abdominal radiograph. It was hypothesized that a normal ultrasonographic range of canine relative kidney size could be determined by measuring the kidney size times the length of a lumbar vertebral body.

Methods: Ten privately owned adult bitches presented as healthy animals to the Onderstepoort Veterinary Academic Hospital for spaying were used. Renal parameters (urea, creatinine, urine analysis), and clinical examination findings were within normal limits. Standard abdominal radiographs (ventrodorsal and right lateral views) were obtained and a standard abdominal ultrasonographic examination was performed using a multi-frequency phased array transducer (5-9 MHz) operated at 5 MHz to rule out any other ultrasonographic abnormal finding. Additionally, the resistive index of both kidneys, the length of the kidneys on a sagittal plane and measurements of each lumbar vertebra were recorded.

Results: All ten animals were healthy. Kidney length measurements were consistent and the resistive indices were all within normal limits. Lumbar vertebrae could be easily visualized and were measured using two different landmarks. Identification of the last lumbar vertebra could be easily achieved, utilizing the lumbosacral junction as reference point. Visualization of the cranial lumbar vertebrae was more cumbersome, since "forward counting" was required for correct identification. This required continuous visualization of the entire lumbar spine, which could be hampered by gastrointestinal gas. Therefore, the caudal lumbar vertebra were considered to be of better use for the relative ultrasonographic measurement of the kidney in the canine patient. Reference ranges for the different ratios will be presented.

Discussion: The results of the present study suggest that the lumbar vertebra can be used to give an ultrasonographic reference ratio for the relative kidney size in the dog similar to the one already existing for radiographic evaluation. Contrary to the radiological study, caudal lumbar vertebra proved to give more consistent and easier obtained results. Due to the small number of animals, this study must be considered as a preliminary study. Further studies on a larger number of healthy animals are needed to establish reference values. The results of this preliminary study are however promising. Additionally, it is envisaged to compare the reference values of healthy animals to those with acute and chronic renal disease. Further studies adapting other radiological relative canine measurements to ultrasound (relative small intestinal, large intestinal and gastric diameter) are planned by the author.

POTENTIAL FOR AEROSOLIZATION OF I-131 ONCE EXCRETED IN FELINE URINE. J.A. Francis, B.A. Poteet. M.H. Fabiani. Gulf Coast Veterinary Specialists, TX, 77027.

Introduction/Purpose: There has been concern that radioactive Iodine may aerosolize when excreted in feline urine leading to exposure of technicians required to treat these patients while they are hospitalized. This potential radiation hazard has also impacted the proper design of ventilation systems that are required for treatment facilities. Therefore, this study was designed to evaluate the potential of iodine aerosolizing in a clinical setting.

Methods: The average exposure of a 24hr collection of cat litter post treatment was determined and representative groups were prepared: Group A: Average exposure of I-131 in cat litter/24hr; Group B: 2x the average exposure of I-131 in cat litter/24hr; Group C: Average exposure of I-131 without cat litter (pooled); Group D: A 5 gallon barrel of radioactive waste; Negative Control: 60cc of sterile saline in cat litter. 5 preparations of Groups A-C were made and placed in individual airtight containers supplied with air pumps to generate airflow representative of A/C within a treatment facility. The containers were also fitted with commercially available air filters made of foam and activated charcoal. After 5 days, the air filters were removed and the total $\mu\text{R/hr}$ were recorded using a Geiger counter held at 1m and 1cm away.

Results: No exposure was measured from the Negative Control Group or Groups A-D at 1 meter away. At 1 cm, there was no exposure measured from the filters of the Negative Control Group, Group A, or Group B. However, there was a significant ($P < .05$) increase in exposure when comparing Group C to the Negative Control and Groups A and B at a 1 cm distance.

Discussion/Conclusion: NaI-131 solution, by itself, appears to aerosolize at low levels; however, when placed in cat litter, this exposure is not measurable. Therefore, cat litter appears to have a binding effect preventing iodine from aerosolizing and should be used in accordance with ALARA protocol. Nonetheless, although the NaI-131 solution is capable of aerosolizing, the actual exposure measured is very minimal and may not warrant extensive air filtration.

^{99m}Tc-DTPA DIURETIC RENOGRAPHY IN DOGS WITH UROLITHIASIS. S. Hecht, G.B. Daniel, I. Lane. University of Tennessee College of Veterinary Medicine, Knoxville, TN 37996.

Introduction/Purpose: Diuretic renal scintigraphy is considered a reliable and non-invasive method to differentiate obstructive from non-obstructive uropathy in human patients. During this procedure the elimination of a radiopharmaceutical from the kidneys is monitored after injection of a diuretic.¹ Non-obstructed kidneys show a rapid washout of the radiopharmaceutical resulting in a steep slope of the renal time-activity curve (TAC), while the TAC in cases of obstruction continues to rise.² A technique for diuretic renography in dogs has been described previously.³ The purpose of this study was to evaluate the results of diuretic renography in dogs with urolithiasis.

Methods: Twenty-seven ^{99m}Tc-DTPA renal scans were performed in 21 dogs with urolithiasis. Unilateral nephrectomy had been performed in one dog, resulting in a total number of 53 kidneys (renal units; RU). An 8 minute dynamic acquisition was performed, with injection of 3.0 mg/kg furosemide 4.5 minutes following injection of 3-4 mCi of the radiopharmaceutical. The RU were subdivided into 3 groups based on scintigraphic and clinical findings (non-obstructive urolithiasis with or without hydronephrosis/hydroureter, obstructive urolithiasis, non-functional kidney). Visual evaluation of the images, visual inspection of the TAC after normalization of the renal counts and calculation of individual excretion half time (T_{1/2}) by means of linear regression analysis were performed for each RU. The results were compared to results in normal dogs.³

Results: There were 45 non-obstructed RU (7 with hydronephrosis and/or hydroureter), 2 obstructed RU (both with hydronephrosis and hydroureter) and 4 non-functional RU (2 of them with hydronephrosis and hydroureter). In 2 RU the result of diuretic renography was inconclusive. In 38/45 cases of non-obstructive urolithiasis, the TAC showed a sudden steep slope after administration of furosemide, in 7/45 cases the curve dropped continuously. There was no significant difference in T_{1/2} between dogs with non-obstructive urolithiasis without hydronephrosis (range 3.0 – 8.0 min; median 4.0 min), dogs with non-obstructive urolithiasis with hydronephrosis (range 3.2 – 6.2 min; median 3.9 min) and normal control dogs (range 3.6 – 5.9 min; median 4.2 min). In both cases of obstructive uropathy, the TAC showed continuous rise after administration of furosemide. In non-functional kidneys, the TAC remained flat.

Conclusion: ^{99m}Tc-DTPA diuretic renography is an additional useful non-invasive tool in the differentiation of obstructive from non-obstructive urolithiasis.

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GLOMERULAR FILTRATION RATE NORMALIZED TO PLASMA VOLUME IS NOT AFFECTED BY INTRAVENOUS FLUID ADMINISTRATION. Naruepon Kampa, Peter Lord, Astrid Hoppe and Enn Maripuu, From the Division of Diagnostic Imaging and Clinical Chemistry, Department of Biomedical Sciences and Public Health (Kampa, Lord), Department of Small Animal Sciences (Hoppe), Faculty of Veterinary Medicine and Animal Sciences, University of Agricultural Sciences, Uppsala, Sweden, and Department of Medical Physics (Maripuu), Uppsala University, Sweden

Introduction: Glomerular filtration rate normalized to plasma volume (GFR/PV) is more physiologically correct than the standard method of scintigraphic GFR relating to body weight (GFR/BW) and does not require a regression equation relating percentage uptake to GFR by standard plasma clearance. Because of the relationship to PV rather than BW, it should be insensitive to hydration status, and a more accurate indicator of renal function. The purpose of this study was to compare the effect of administering fluid to suspected dogs with renal disease on GFR measured by GFR/BW and GFR/PV.

Material and Methods: Eleven studies from ten dogs suspected of having kidney disease; one dog was examined twice, with a 6 month interval. Individual kidney GFR/BW (IKGFR/BW) and individual kidney GFR/PV (IKGFR/PV) were measured in each dog by scintigraphy at its normal condition and after administering fluid intravenously (15 ml/kg BW, rate at 5-7 ml/min/kg) using an automatic infusion pump. IKGFR/BW was measured by a standard method for kidney scintigraphy¹. IKGFR/PV was measured by an alternative scintigraphic method² using the Patlak plot to measure uptake of activity. Two observers measured all of studies and the results were averaged to decrease the between observer variability. The paired t-test was used and significant was determined at 0.05.

Results: The difference between baseline (1.37 ml/min/kg) and post fluid (1.60ml/min/kg) of IKGFR/BW was highly significant (p=0.0012). The IKGFR/BW was 15 % higher after giving the fluid. No significant difference between mean IKGFR/PV baseline (14.8 ml/min/L) and post fluid mean (15.6 ml/min/L) (P=0.59) was found.

Conclusions: GFR/BW is affected by body fluid volume³ (hydration condition) without any change in the functional capacity of the glomeruli. This study has proven that normalizing GFR to PV corrects for this variable. Thus GFR/PV measures the true condition of the kidney.

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DYNAMIC UPTAKE STUDIES OF 2-DEOXY-2-[¹⁸F]FLUORO-D-GLUCOSE (¹⁸FDG) IN NORMAL DOGS AK LeBlanc¹, DW Townsend², B, Jakoby^{2,3}, GB Daniel¹. ¹University of Tennessee College of Veterinary Medicine, ²University of Tennessee Medical Center, ³Siemens Molecular Imaging, Knoxville, TN , 37996.

Introduction: Positron Emission Tomography (PET) is a diagnostic procedure commonly performed in humans to diagnosis and stage neoplastic disease. The radiopharmaceutical most commonly used for this purpose is 2-deoxy-2-[¹⁸F]fluoro-D-glucose (¹⁸FDG). We are performing PET imaging at our institution for translational research utilizing animal models for human disease. We have access to a large field-of-view (FOV) LSO PET scanner (P39, Siemens Molecular Imaging). This scanner has a 70 cm bore diameter and an unprecedented 53 cm FOV, allowing for acquisition of multi-organ kinetic data. Measurement of ¹⁸FDG uptake has been primarily limited to a semi-quantitative method using standardized uptake values (SUV) derived from static images acquired 60 minutes following injection. Kinetic data showing ¹⁸FDG uptake/clearance is limited because acquisition of dynamic data is limited to the scanner's FOV, typically 10 cm. The goals of this study were to establish an imaging protocol that would allow kinetic data to be obtained simultaneously from the thorax and abdomen of dogs, determine normal distribution of ¹⁸FDG uptake, and determine kinetics of ¹⁸FDG of the major parenchymal organs.

Methods: Eight young female, purpose-bred mongrel dogs weighing 10.8 ± 0.8 (mean \pm SD) kg were used. The dogs were considered normal based on physical exam, routine blood work, and imaging of the thorax and abdomen. The dogs were lightly anesthetized and placed in ventral recumbancy to include the entire thorax and abdomen within the scanner's FOV. The dogs were injected with 96.2 ± 6.6 (mean \pm SD) MBq of ¹⁸FDG and a 2 hour, dynamic list-mode acquisition was initiated simultaneously with the injection. The images were reformatted into 24, 5 minute frames. Regions of interest were drawn over liver, spleen, renal cortices, thymus, and left ventricle free wall. Time-activity-curves were created and fitted with either a biexponential, linear or polynomial curve fit depending on the shape of the time-activity-curves. Counts were expressed as Bq/cc of tissue.

Results: Radioactivity within liver and renal cortex had an initial rapid decline, followed by a more gradual decrease in radioactivity, fitted with a double compartmental model. The fast and slow-phase T_{1/2} for liver and kidney were 4.35 and 196.09 min, and 4.84 and 156.02 min, respectively. The decline in splenic radioactivity was linear, dropping to 90% of baseline after 60 min and to 80% after 120 min. The thymus and intestinal tract increased over time, with thymic uptake reaching peak activity 105 minutes following injection. Comparing the relative activity of abdominal organs, the liver, kidneys and intestinal tract had the most intense uptake of ¹⁸FDG. The intensity of the spleen was 40% percent less that the liver between 60-120 minutes. Following blood pool clearance, there was little cardiac activity seen. There was no appreciable lung uptake.

Conclusion: Simultaneous uptake kinetics of ¹⁸FDG from multiple organs is possible. The uptake in most normal organs decreased over the 2 hour period, but did not change dramatically between 60-120 minutes. Intestinal activity becomes more prominent over time. The thymus of immature dogs also increased during the first 105 minutes following injection. The heart did not accumulate the ¹⁸FDG, which is common under resting conditions.

SINGLE-PHOTON EMISSION COMPUTED TOMOGRAPHY IN DOGS WITH INSULINOMA: COMPARISON WITH SOMATOSTATIN RECEPTOR 1, 2, 3, AND 5 EXPRESSION. Joris H. Robben, Susanne Aeb Boroffka, Yvonne Wea Pollak, Jan A Mol

Introduction/Purpose: Octreotide has important diagnostic (somatostatin receptor scintigraphy (SRS)) and therapeutic (inhibition of hormone hypersecretion, radionuclide therapy) applications in human pancreatic endocrine tumors. However, high diagnostic and therapeutic failure rates, particularly in human insulinoma, limit its use. This has been attributed to the absence of high-affinity somatostatin receptors (SSTR) on these tumors (SSTR subtype 2 and 5), but the low incidence of human insulinoma hampers further study of this. In this study, we report on the results of SRS performed in 19 insulinoma dogs and compare these results with SSTR subtype expression in tumor tissue obtained from these dogs.

Methods: Single-photon emission computed tomography (SPECT) was performed 6 h after intravenous administration of [¹¹¹In-DTPA-D-Phe¹]-octreotide in 19 dogs, clinically suspect of an insulin-producing pancreatic endocrine tumor (insulinoma). Samples of both primary tumor and metastases were collected at surgery from 17 dogs and at necropsy, immediately after euthanasia, from 2 dogs. SSTR subtype gene expression was determined with a reverse transcriptase polymerase chain reaction (RT-PCR). Results of SRS were compared with the occurrence of SSTR1, 2, 3, and 5 mRNA in tissue samples of the primary tumor and metastases.

Results: A total of twenty primary insulinomas were found in 19 dogs at surgery or necropsy. Thirteen primary tumors were identified with SPECT, whereas 7 were negative. Samples of the primary SPECT-negative tumors expressed all SSTR subtypes (only one tumor was negative for SSTR3 and two tumors were negative for SSTR5). In contrast, two SPECT-positive tumors were negative for SSTR2, 3, and 5. A total of 15 metastatic lesions (8 lymph nodes, 7 livers) were found in 9 dogs. Four lymph node metastases and one or more metastases in 4 livers were demonstrated with SPECT. Six samples (4 SPECT-positive, 2 SPECT-negative) expressed all the SSTR subtype genes (with the exception of a SPECT-positive liver metastasis which did not express the SSTR5 gene).

Discussion/Conclusions: This study demonstrated various expression of SSTR1, 2, 3 and 5 in canine insulinoma. As shown for human neuro-endocrine gastroenteropancreatic tumors, our SPECT results did not correlate with the pattern of SSTR subtypes gene expression, as determined by RT-PCR. Negative results with SPECT are probably not only dependent on the pattern and level of expression of various SSTR subtypes, but also on blood supply, the presence of intratumoral areas of necrosis and hemorrhage, locally high concentrations of endogenous somatotropin release inhibiting factor, down-regulations of SSTR's by various factors (glucocorticoids), tumor size, and certain technical aspects of SRS. Furthermore, the recent hypothesis of the existence of an as yet unknown subtype should also be considered.

COMPARISON BETWEEN NUCLEAR SCINTIGRAPHY AND TRANSRECTAL ULTRASONOGRAPHY IN THE DETECTION OF SACROILIAC ABNORMALITIES

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Introduction: Sacroiliac (SI) pain has now been recognized as a major cause of poor performance and gait abnormalities in sport and racing horses. In the recent years, diagnostic imaging procedures have been developed to identify SI lesions¹⁻³. Nuclear scintigraphy is considered as a technique of choice^{1,2}, though it should be associated with the other diagnostic modalities available for the practitioner. The technique and interest of ultrasonographic examination of the SI region have been described³. The purpose of this retrospective study was to compare the grades of ultrasonographic (transrectal) and scintigraphic abnormal findings detected in the SI region on 33 horses, *ie* 66 SI joints.

Material and Methods: Thirty-three horses referred for nuclear scintigraphy with examination of the pelvis were included. Transrectal ultrasonographic examination of the pelvis was performed with a linear or micro-convex endorectal 7.5 MHz probe. The SI joints were examined on a paramedian plane on each side. Ultrasonographic abnormal findings of the SI joints were graded on a 4-point scale (0=normal to 3=severe). The nuclear scintigraphic examination of the pelvis included systematically 4 views: dorsal, dorsocaudal, right and left obliques (gamma-camera parallel to the ilium wing). The localisation and grade of the increased radiopharmaceutical uptake (IRU) were defined on the right and left oblique views of the pelvis. Five sites of IRU were defined in the SI region and the IRU was graded subjectively on a 4-point scale (0=normal to 3=severe). The grades were considered as coherent between both imaging techniques if they were either similar or 1-grade different.

Results: The grades of IRU and abnormal ultrasonographic findings were found to be coherent in 77.3% (51/66) of the sacroiliac joints examined. 2/66 SI joints showed abnormal ultrasonographic findings (grade 2) when no IRU was detected in the SI area. Conversely, 13/66 SI joints were considered ultrasonographically normal when a marked IRU (grade 2-3) was detected in nuclear scintigraphy.

Discussion/Conclusion: The interest of this study is to establish quantitative comparison data between two imaging procedures recognized as main tools in the diagnosis of sacroiliac injuries. The results demonstrate a good coherence between transrectal ultrasonography and nuclear scintigraphy in the detection of SI abnormalities. Transrectal ultrasonography of the pelvis is easily accessible in field practice, as no specific equipment is required, and allows a real-time diagnosis of SI lesions. This study also points out the interest of the oblique views of the pelvis in nuclear scintigraphy, as they allow the identification of several sites of IRU in the SI area.

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COXO-FEMORAL INJURIES DIAGNOSED BY EXTERNAL ULTRASONOGRAPHY OR STANDING RADIOGRAPHY IN EQUIDAE : RETROSPECTIVE STUDY OF 9 CASES. V. De Busscher*, G. Bolen*, V. Busoni*, *Medical Imaging Section – Department of Clinical Sciences – Faculty of Veterinary Medicine – University of Liège –4000 Liège – Belgium

Introduction/Purpose: Because of the extensive musculature and the size of horses, hip injuries often represent a diagnostic challenge for the equine clinicians. Hip radiographic examination is usually said to require general anaesthesia. External ultrasonography has been used to image the dorsal aspect of the hip and the technique for standing radiography has been presented. The aim of this retrospective study is to determine diagnostic findings in equidae with hip injuries diagnosed by ultrasonography and/or standing radiography.

Methods: Medical records were reviewed to select horses and donkeys that underwent diagnostic imaging examination of the hip. Clinical cases with an imaging diagnosis of hip damage were used for this study. Medical records, radiographs and ultrasonographic findings were reviewed. History, clinical signs and diagnostic findings were collected. Eighteen animals underwent hip imaging between January 2000 and December 2005 and 9 (6 horses, 2 ponies and 1 donkey) had abnormal findings and were used for this study.

Results: Of the 9 selected cases, 3 animals (2 ponies and 1 donkey) had coxo-femoral luxation, 6 patients had acetabular (5 horses) or femoral neck (1 horse) fractures. All horses had severe or non weight-bearing lameness. Ultrasonography was performed prior to radiographs and diagnosis was achieved by ultrasonography in 7 patients (6 horses and 1 pony). One pony and 1 donkey had standing hip radiographs diagnostic for luxation and did not undergo ultrasonographic examination. One horse did not undergo to the standing radiographic examination because of its size. Multiple fragments in the region of the acetabulum or of the femoral head were seen at ultrasonography as bone surface irregularities and echoes penetrating the bone in case of fracture. The major ultrasonographic finding in the horse with coxo-femoral luxation examined by ultrasonography was inability to image a normal dorsal coxo-femoral joint space. Standing radiographs confirmed the ultrasonographic diagnosis in 6 cases and helped to evaluate the extent of the damage in case of fracture.

Discussion/Conclusions: The results of this retrospective study support the fact that the diagnosis of coxo-femoral injury can be achieved by external ultrasonography. Standing radiographs can be obtained in most patients and may help to confirm the diagnosis and evaluate the extent of the damage. However, because standing radiographic examination presents real risk of damage to the equipment, it is impossible to realize with a portable X-ray machine, and it is a significant radiation hazard to attending personnel, ultrasonography should be preferred to radiography in large size animals.

ULTRASONOGRAPHIC FINDINGS IN 57 HORSES SUSPECTED OF STIFLE JOINT PATHOLOGY. M. Hoegaerts, K. Rosiers, J.H. Saunders, Department of Medical Imaging, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium

Introduction/Purpose: Injuries of the equine stifle are frequent causes of hind limb lameness. A protocol for standardised and systematic US examination of the equine stifle has been described.¹ The aim of this study was to describe the US findings in 57 horses suspected of stifle joint pathology.

Methods: Fifty-seven horses suspected of stifle joint pathology were used in this study. There were 13 stallions, 22 geldings and 22 mares. Age ranged from 4 months to 19 years (mean=6.9 years; median=4.5 years). A complete US examination was performed in 5 steps according to a previously described protocol.¹ Mean duration of an examination was 40 minutes. The cranial approach in flexion (step IV) and the caudal approach (step V) were not performed in 17, mostly uncooperative, horses. In 10 horses, the contralateral stifle was scanned for comparison.

Results: Meniscal lesions were found in 11/57 (19%) horses (medial=10; lateral=1). The medial meniscal lesion was visible in the cranial part of the meniscus in 2 horses, the cranio-medial part in 3 horses, the medial part in 3 horses, the caudo-medial part in 1 horse and no lesion was observed in the caudal part. In one horse the location was not recorded. Joint distension and/or synovitis was found in the medial femoro-tibial joint in 34/57 (60%) horses, femoro-patellar joint in 21/57 (37%) horses, lateral femoro-tibial joint in 13/57 (23%) horses. The cranial menisco-tibial ligament of the medial meniscus was affected in 7 horses (abnormal fibre structure=4; abnormal tibial insertion=3). The cranial menisco-tibial ligament of the lateral meniscus showed an abnormal fibre structure in 1 horse. The medial femoral ridge showed osteochondritic changes in 8/57 (14%) horses and the lateral ridge in 9/57 (16%) horses. The medial femoral condyle showed pathology in 10/57 (18%) horses, the lateral condyle in 1/57 (1%) horse, the medial and lateral tibial condyles each in 2/57 (3%) horses. The patellar ligaments showed abnormalities in 13/57 (23%) horses (medial=2, intermediate=10, lateral=5). The medial collateral ligament (including its attachment to the meniscus) was affected in 16/57 (28%) horses (1 rupture, 3 desmitis, 12 disruptions between meniscus and medial collateral ligament). No horse had lesions of the lateral collateral ligament. A lesion of the cruciate ligaments was suspected in 2 horses (1 cranial, 1 caudal). Osteoarthritic changes were present in 13/57 (23%) horses. The contralateral limb showed the same abnormalities as the ipsilateral limb in 8 horses (patellar ligaments=3, synovitis=4, osteochondrosis lateral ridge=1) and was normal in 2 horses.

Discussion/Conclusions: The most common abnormalities were injuries to the medial femoro-tibial joint (medial collateral ligament, meniscus) and patellar ligaments. Based on the findings made in this study, we should recommend to systematically perform an US examination of both stifle joints.

¹ Hoegaerts M., Saunders J.H. How to perform a standardized ultrasonographic examination of the equine stifle ? Annual Meeting of the American Association of Equine Practitioners, Denver, USA 2004

ACCURACY OF ULTRASONOGRAPHY IN THE DIAGNOSIS OF RECURRENT LARYNGEAL NEUROPATHY IN HORSES. HJ Chalmers, J Cheetham, AE Yeager, HO Mohammed, NG Ducharme. Department of Clinical Sciences and Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY, USA, 14853.

Introduction: There are several challenges currently associated with the practical and accurate diagnosis of recurrent laryngeal neuropathy (RLN) in performance horses. These include lack of availability of treadmill facilities, the risk associated with treadmill tests, poor agreement about which lesions are performance limiting, and imperfect correlation between resting and exercising laryngeal grades. A laryngeal ultrasound technique was developed as a complementary diagnostic test with the aim of addressing these concerns.

Methods: The accuracy of ultrasonography as a diagnostic test for RLN was evaluated in 31 horses presenting with upper airway disease. Assessment of *cricoarytenoideus lateralis* muscle (CAL) and real time observation of arytenoid cartilage and vocal fold movement was performed by a blinded examiner. All horses were subjected to videoendoscopy and laryngeal grading at rest and during treadmill exercise. The laryngeal grades during treadmill exercise served as the gold standard for RLN, the grades were dichotomized such that grade "A" horses were considered negative for RLN and grade "B" and "C" horses were considered positive for RLN.

Results: The finding of abnormal CAL echogenicity was the most useful of the ultrasonographic parameters in detecting RLN (sensitivity = 83.3%, specificity = 100%, n=31). Detection of vocal cord and arytenoid cartilage movement was not as accurate in diagnosing RLN.

Conclusion: Laryngeal ultrasound may become a valuable tool in evaluation of RLN and the use of this technique may contribute to improved case management.

THE MAGIC ANGLE EFFECT, A POSSIBLE CAUSE OF INCREASED MAGNETIC RESONANCE IMAGING SIGNAL INTENSITY IN THE COLLATERAL LIGAMENTS OF THE DISTAL INTERPHALANGEAL JOINT IN HORSES

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Introduction: Magnetic Resonance Imaging (MRI) of the equine foot has been shown to be beneficial in refining the differential diagnosis of foot lameness when radiography and ultrasound are inconclusive. Lesions of the deep digital flexor tendon and of the collateral ligaments of the distal interphalangeal joint are the most commonly reported diagnoses. We have noticed an increased signal in the collateral ligaments of sound horses on MRI examination with a 0.25 T ESAOTE G-scan MR system, which has a vertical orientation of the main magnetic field (B_0). We hypothesized that the Magic Angle effect was responsible for the increased signal detected in normal collateral ligaments of the distal interphalangeal (DIP) joint. The objectives of the studies were 1./ to show that the signal intensity in the collateral ligaments of the DIP joint was dependent on the orientation of the foot relative to B_0 and 2./ to identify, among commonly used MRI pulse sequences, the most susceptible to an artifactual signal change within the collateral ligaments of the DIP joint.

Methods: The right thoracic foot of a skeletally mature horse, with no known history of lameness, was imaged using a human knee radiofrequency coil in a 0.25 T magnetic field (ESAOTE G-scan) with the long axis of the foot perpendicular to B_0 (sagittal plane oriented horizontally) and in 4 additional positions with a slight angle off the horizontal plane. Transverse images were obtained using a Spin Echo (SE) T1-weighted pulse sequence and a Fast Spin Echo (FSE) dual (proton density (PD) and T2-weighted) pulse sequence. A 3D Gradient Echo (GE) T1-weighted pulse sequence was acquired in the dorsal plane, aligned with the long axis of the collateral ligaments. The signal to noise ratio (SNR) in both medial and lateral collateral ligaments was measured in each position with each sequence. The angle between the long axis of the ligaments and B_0 was measured in each position.

Results: A markedly increased signal intensity was present in the ligament on SE T1-wi, FSE PD-wi and 3D GE T1-wi when the angle between the ligament and B_0 approached 55° . There was only little change in SNR with the FSE T2-wi. The maximal SNR (14.3) was reached at 55° with the 3D GE T1-wi compared to the SNR of 2.7 in the same ligament with the same pulse sequence at 70° relative to B_0 .

Discussion: The increased signal intensity on short TE pulse sequences (PD and T1-wi), when the ligament is oriented at an angle close to 55° relative to B_0 , is characteristic of the “Magic Angle” effect. Due to the anatomic orientation of the collateral ligaments of the distal interphalangeal joint, slight deviation from the long axis of the foot perpendicular to B_0 can be responsible for an artifactually increased signal in one of the collateral ligaments. It is important to prevent the occurrence of this artifact by carefully positioning the foot or to be able to recognize it from a true desmitis lesion.

M-MODE ULTRASONOGRAPHIC MEASUREMENT OF DISTANCE BETWEEN MITRAL VALVE A POINT AND INTERVENTRICULAR SEPTUM IN IRANIAN ARABIC HORSE. G. Assadnassab, Assistant Professor of Radiology in Tabriz Azad Islamic University, Iran

Introduction: Echocardiography is a diagnosis way which uses high frequency waves in order to evaluate heart function and blood circulation velocity during heart cycle periods. M-mode is one of the indicator diagrams of echocardiography which represents heart in a period of time when we set the indicator on a special district.

Methods: We show time on X axis and mobility on Y axis. Although M-mode echocardiography is an optional technique to measure walls thickness and chamber diameters, it is useful to recording cardiac diagrams mobility patterns such as valve mobilities. During a cardiac cycle M-mode mitral valve mobilities show that each phase of cycle remarks with a letter on diagram. Mobility waves size and their chronology are indicated on diagram by special letters and gives significant information about blood circulation and valve function. These particular mobilities are important in order to diagnose some arrhythmia. In this study we used 6 healthy horses which are 4-6 years old.

Results/Conclusion: On this diagram, A point shows the maximum end diastolic valve phase which indicates diastolic valve function and changes are caused by various diseases, for example one of the important signs of ventricular malfunction is caused by E and A waves reversion in atrium valve. Echocardiography was done under the care of standard right side longitudinal axis which shows cusps of mitral valve in this view then the indicator of M-mode is adjusted on proximal cusp. Beneath closely observations on mitral valve M-mode curve, we can measure the distance between A point and interventricular septum. In this research the distance between A point and interventricular septum was 24.90 +/- 0.9 millimeters.

Please Note: Poster 2 has been withdrawn.

VIRTUAL RADIOGRAPHY OF THE HORSE. C. Boulocher¹, Clare Newlands², E.M. Frame³, G. McConnell² ¹Département des Animaux de Compagnie, Unité d'Anatomie et d'Imagerie, Ecole Nationale Vétérinaire de Lyon, Avenue Bourgelat, 69 280 Marcy l'Etoile, France, ² Veterinary Teaching Organisation, Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Summerhall, Edinburgh EH9 1QH.
³Veterinary Clinical Studies, Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Easter Bush Veterinary Centre, Roslin, Midlothian EH25 9RG;

Introduction/Purpose: The “Virtual Radiography of the Horse” is an interactive diagnostic imaging website that aims to illustrate radiographic techniques and create a digital bank of normal radiographs with anatomical features highlighted. The text is based on the “Equine Radiography Handbook 2004”, used to teach radiographic techniques of the horse at the Royal (Dick) School of Veterinary Studies, Edinburgh.

Materials and Methods: Digital photographs were made of live horses undergoing routine radiography to illustrate the techniques used for each anatomical region. Normal radiographs showing standard views of the region were digitally photographed. Corresponding anatomical specimens underwent computed tomography from which three dimensional reconstructions of the bone structures were made. A website was constructed to link the technical demonstrations with the corresponding radiographs and three dimensional reconstructions images of the anatomical region.

Results: Standard normal radiographs are complemented by three dimensional movies based on tomodesitometry data, using software more normally used for surgical planning in human medicine. The use of this tool for educational purposes is presented. Additionally, digital images, rotational movies and interactive anatomical/radiographic models are catalogued as Reusable Learning Objects in the repository of the University Edinburgh, making them available for use in tutorials or talks in several areas (diagnostic imaging, equine medicine or surgery).

Discussion / Conclusion: The association of three dimensional reconstructions (both radiographic and opaque bone within transparent skin) and radiographs is a new approach to teaching in veterinary medicine and is illustrative of the increasing importance of on-line learning resources. The use of medical reconstructive software is shown to be valuable in the new context of veterinary education.

PRELIMINARY EVALUATION OF A PROTOCOL FOR FAST LOCALIZED ABDOMINAL SONOGRAPHY IN HORSES (FLASH) ADMITTED FOR COLIC

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Introduction: Abdominal ultrasonography is a part of the acute abdomen diagnosis protocol in many equine clinics. Although hand-held ultrasonographic equipment is now commercially available and may increase the speed of ultrasonography in assessing the abdomen of the equine patients, ultrasonographic assessment of the entire equine abdomen is time consuming and it is difficult to carry out at patient's admission. The aims of this preliminary study were: 1. to establish a protocol for fast localized abdominal sonography of horses (FLASH) admitted for colic, 2. to assess the usefulness of a fast sonographic examination limited to specific abdominal regions and 3. to determine whether FLASH can be performed by clinicians without extensive experience in equine abdominal ultrasonography in less than 15 minutes.

Material and Methods: Client-owned horses referred for colic were included prospectively and evaluated at admission. FLASH was realized with a portable ultrasound machine by one of 5 operators without extensive experience of equine abdominal ultrasonography, previously trained to FLASH. The time used for FLASH was measured. Seven locations were assessed without clipping the horse: 1. ventral abdomen (from cranial to caudal), 2. gastric window, 3. spleno-renal window, 4. left middle third of the abdomen, 5. duodenal window, 6. right mid abdomen, 7. thoracic window. The ability of FLASH to detect free fluid, dilated turgid small intestinal loops or fluid filled non turgid small intestinal loops, the ability to assess the motility of dilated small bowel, the quality of the content of the large intestine and the ability to see the left kidney were assessed. Results were compared with the findings at surgery, with clinical serial examinations and outcome for non-surgical cases, or with *post-mortem*.

Results: 26 horses were included. All the operators were able to obtain ultrasonographic images in the horses without clipping and to provide useful information about small and large intestine and about the presence of free abdominal fluid. FLASH was able to show abnormal small intestinal loops and abnormal colon content. The visualization of dilated turgid small intestinal loops was always associated with strangulated small intestinal obstruction. Non turgid fluid filled small intestinal loops were seen in horses with simple displacement of the large bowel or medical colic and positive outcome. Fluid content in a segment of the large intestine was seen in 4 horses with colon impaction. The time used for FLASH ranged between 7 minutes to 17 minutes, with only 2 studies lasting more than 15 minutes and a mean duration of 10.7 minutes.

Conclusions: Results suggest that FLASH is a simple and rapid technique that can be performed in an emergency setting to detect intra-abdominal free fluid and other major intra-abdominal abnormalities in patients admitted for colic. FLASH can be used by veterinary clinicians without extensive experience in ultrasonography and has potential usefulness for surgical pathology discrimination in acute abdominal pain.

EVALUATION OF CANINE PARTIAL CRANIAL CRUCIATE LIGAMENT RUPTURE WITH COMPUTED TOMOGRAPHIC ARTHROGRAPHY

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Introduction/Purpose: Computed tomographic arthrography (CTA) of four cadaveric canine stifles was performed in order to verify the possibility of the CTA examination for the diagnosis of partial cranial cruciate ligament rupture.

Methods: To obtain the sequential true transverse image of cranial cruciate ligament, ligament was scanned such that the plane of scanning was parallel to the fibula before and after partial cranial cruciate ligament rupture. The average percentage size of both normal and defected ligament after partial rupture of cranial cruciate ligament was compared at CTA imaging.

Results: True transverse image of cranial cruciate ligament was identified on every sequential images beginning just proximal to the origin of the cranial cruciate ligament to distal to the tibial attachment after administration of iodinated contrast medium. The average percentage size of the normal cranial cruciate ligament after partial cranial cruciate ligament rupture remained 91.5 ± 6.7 % ranging 85 % ~ 104%, however that of the defect lesions was significantly decreased to 51.7 ± 22.9 % ranging 17 % ~ 83 % at CTA imaging.

Discussion/Conclusions: This result implies that CTA may be used for the diagnosis of partial rupture of cranial cruciate rupture in dogs.

THREE-DIMENSIONAL CT ANGIOGRAPHY OF CANINE HEPATIC VASCULATURES.

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PURPOSE: The aims of this study were 1) to develop the computed tomography angiography (CTA) technique for obtaining canine hepatic vasculatures and 2) to obtain anatomic information of hepatic vasculatures by CT angiography.

METHODS: Eight Beagle dogs were anesthetized and imaged using a single channel helical CT scanner. Contrast medium used in this study was iohexol (300 mgI) and concentrations were 0.5 ml/kg in cine scan, 2 ml/kg, 3 ml/kg, and 4 ml/kg in each group of enhanced scan and flow rate was 2 ml/sec in all groups. This study was divided into 3 steps; unenhanced, cine and enhanced scan. Enhanced scan was subdivided into the arterial phase and the venous phase. Helical scan parameters were 5 mm thickness, 3 mm intervals, and 1.3 pitch in unenhanced scan, 3 mm thickness, 50 images, and 1.5 seconds per rotation in cine scan, 5 mm thickness, 3-5 mm intervals, and 1.3-1.5 pitch enhanced scan. Cine scan place and enhanced scan range were confirmed by unenhanced scan. Enhanced scan in arterial phase (first phase) was from celiac artery to cranial portion of liver and in venous phase (second phase) was from cranial portion of liver to 4th lumbar vertebra level.

RESULTS: In cine scan, the best optimal times were 9 seconds delay time post IV injection in the arterial phase, 18 seconds delay time post IV injection in the venous phase. Nine seconds delay time was acceptable for imaging canine hepatic arteries by CTA and at just next venous phase scan was well visualized to venous structures of liver.

CONCLUSIONS: Dual phase CTA with 5 mm slice thickness, 1.3-1.5 pitch, and 3 ml/kg CM dose was a useful method for detecting information about canine hepatic vasculatures.

FELINE RADIOGRAPHIC DIGITAL IMAGE BANK. C. Boulocher¹, E.M. Frame², G. McConnell³, Clare Newlands³, ¹ Département des Animaux de Compagnie, Unité d'Anatomie et d'Imagerie, Ecole Nationale Vétérinaire de Lyon, Avenue Bourgelat, 69 280 Marcy l'Etoile, France ; ² Veterinary Clinical Studies, Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Easter Bush Veterinary Centre, Roslin, Midlothian EH25 9RG, Scotland; ³ Veterinary Teaching Organisation, Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Summerhall, Edinburgh EH9 1QH, Scotland

Introduction/Purpose: Standard radiography remains the most accessible and frequently used imaging technique in veterinary medicine. An excellent archive of radiographic films of all species at the R(D)SVS represented an under-utilised teaching resource because of accessibility problems. Survey has shown that the majority of clinical specialties at the veterinary school have a need for diagnostic images for inclusion in course material. Academic staff currently spend valuable time searching for suitable images to reproduce in lectures and continuing education courses. Duplication of work is inevitable due to overlap in relevance of material between specialties. The aim of this project was to make a radiographic digital bank of catalogued learning objects shared through CLIVE* for self directed learning by veterinary students and as a teaching reference archive for clinical and preclinical staff in small animal veterinary medicine across the UK. The cat was selected as the model for this project since no collection of digital radiographic images of normal and abnormal radiographic anatomy of this species is, to our knowledge, currently available.

Methods: Normal radiographs showing standard views of the various anatomical regions of the cat were selected from the archive and digitally photographed. These were incorporated into the image bank and catalogued as learning objects. Phase two of the project, now underway, involves adding interactive labelling system allowing the student to delineate each of the normal anatomical features seen on the radiographs.

Results: The outcome was the development of a digital bank of radiographic images of the normal cat which is being disseminated through CLIVE.

Discussion/Conclusion: With rising student numbers, veterinary teaching is becoming increasingly dependent on self-teaching programmes such as those provided by the CLIVE network and e-learning. Diagnostic imaging is a specialty which particularly lends itself to e-learning since the majority of course information can be transferred to the student using interactive self teaching programmes based on digital images.

*Computer-assisted Learning In Veterinary Education

DUPLEX DOPPLER ULTRASOUND OF THE CEREBRAL VASCULATURE IN DOGS WITH NEUROLOGICAL DISORDERS. CARVALHO,C.F.; ANDRADE NETO,J.P.; CHAMMAS,M.C.; SILVA, C.G. INRAD, São Paulo,

Introduction: Transcranial duplex Doppler scan (TCD) is a non-invasive tool of diagnostic to assessment cerebral hemodynamics and relatively cheap method for evaluate intracranial stenosis or occlusions and arterial vasospasm after subarachnoid hemorrhage. The literature suggests that with ultrasound Doppler is possible to correlate changes in cerebral arteries with intracranial pressure elevation in human patients with brain edema and hydrocephalic infants. This work has a purpose to demonstrate that TCD is able to localize focal lesions and detect hemodynamics disorders.

Methods: Duplex Doppler ultrasound was performed to determine the resistive index (RI) values of cerebral arteries in 50 unsedated dogs (aged from 3 months to 16 years old) with neurological disorders or historic of trauma. It was considered cerebral vascular RI normal values between 0,45 and 0,55 ($0,50 \pm 0,05$) as reported in veterinarian literature. In this study, dogs with less than 3 months are excluded because they would be expected to have higher resistive index. Color Doppler ultrasound always was used to help identify cerebral vessels. Dogs with focal lesions identified in ultrasound were submitted to eletroencephalography to localize lesion and comparing with informations given by ultrasonography.

Results: In 80% of examined dogs presented closed fontanelle. The results suggests that in 90% of all examined dogs it was possible measure RI of rostral cerebral artery (RCA) and/or media (MCA) and/or caudal cerebral artery (CCA) from opened fontanelle window and/or temporal window. The RCA was more difficult to be identified using transtemporal window, but easier in sagital scans of dogs with opened fontanelle using this one. The CCA was more easily found in transverse scans using transtemporal window. In 10% (5 dogs) of the patients it wasn't possible obtain espectral Doppler imaging: in 3 dogs it was obtained color Doppler imaging with some low velocity flow vessels; and in 2 dogs it was impossible due animal temper. In 95% of focal lesions identified by ultrasonography were confirmed by eletroencephalography and clinical examinations. In addition, 10% (5 dogs) of the examined patients has normal values for RI. These dogs were being treated and presented a stable clinical condition.

Conclusion: These results suggest that elevated RI values might indicate acute or progressive process. This study also suggests that TCD is a non-invasive and easy to perform technique able to give additional information of physiologic state in a number of cerebral diseases and to localize focal lesions, especially when we don't have another imaging method of diagnostic. And finally, this method may be very useful to monitoring clinical treatment of neurological disorders.

RADIOGRAPHIC FINDINGS IN SEVERAL JOINTS OF NINE ZOO BEARS

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Introduction: Zoo animals today are increasingly entering geriatric status and the care of these animals and especially the decision to euthanize are not only important health issues, but also ethical ones. The purpose of the study was to gain radiographic data from joints of zoo bears in order to ascertain the incidence of osteoarthritis as one parameter of a scoring system to aid in decision making for euthanasia in geriatric zoo animals.

Methods: Radiographic examination of the elbows, hips, stifles and tarsal joints of nine captive bears in Switzerland and France ranging in age from 11 to 33 years was performed. The individuals were divided into two groups, those without (n=4) and with (n=5) lameness and/or gait abnormalities. The radiographs were scored by the presence of either no or mild signs or moderate to severe signs of osteoarthritis.

Results: Radiographic changes were detected in both groups. Furthermore, lameness or gait abnormalities were thought to have a correlation with the radiographic findings only in two bears. Osteoarthritis was present radiographically in most of the joints. In some elbow and tarsal joints, marked cuff-like, peri-articular mineralisations were detected. One stifle showed changes consistent with osteochondromatosis. In two bears, signs of a bilateral partial collapse of the central tarsal bone and degenerative joint disease were present. Extra-articular bony lesions consisted of an enostosis-like lesion in the tibia of one bear and marked linear mineralisations in the soft tissue of the crural region in another.

Discussion/Conclusions: Osteoarthritis appears to be very prevalent in the population of bears examined in this report. However, correlation of the radiographic findings to clinical disease is difficult.

A STANDARDIZED PROTOCOL FOR THE ULTRASONOGRAPHIC EXAMINATION OF THE EQUINE TARSUS. M. Hoegaerts, J.H. Saunders, Department of Medical Imaging, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium

Introduction/Purpose: Injuries of the equine tarsus are frequent causes of hind limb lameness. The aim of this study was to establish a protocol for the standardised and systematic ultrasonographic (US) examination of the equine tarsus.

Methods: Four hind limbs of horses that were euthanatized for non-orthopedic reasons and 2 normal adult horses were used. The limbs were properly prepared. The examinations were performed with a linear 6-9 Mhz (Logiq 200 pro, GE) and a linear 7-14 MHz matrix (Logiq 7, GE) transducer. A protocol was established in 4 steps (“four-step-tour”) for a complete US examination of the equine tarsus. The 4 steps were performed with the leg in weight-bearing position. In step I, the dorsal aspect of the joint was evaluated (talar ridges, intermediate ridge tibia, long digital extensor tendon, peroneus tertius tendon, tibialis cranialis muscle and tendon, retinacula, dorsal recess of tarsocrural joint). In step II, the lateral aspect of the joint was evaluated (lateral digital extensor tendon, straight and oblique parts of lateral collateral ligament, plantar recess of the tarsocrural joint). In step III, the medial aspect of the joint was evaluated (straight and oblique parts of medial collateral ligament, flexor digitorum medialis tendon and plantar recess of the tarsocrural joint). Finally, in step IV, the plantar aspect of the joint was evaluated. Proximally to the calcaneus the superficial digital flexor tendon including its retinaculum, the tendon of the gastrocnemius muscle and the area of the different bursae were scanned. Distally to the calcaneus, the plantar ligament, the superficial digital flexor tendon, the deep digital flexor tendon, and the area of the tarsal sheath were scanned.

Results: All approaches were well tolerated. During the dorsal approach, the talar ridges, long digital extensor tendon and dorsal recess of the tarsocrural joint were easily scanned. The peroneus tertius and tibialis cranialis muscles were easily seen till the level of their division. The imaging of their distal insertions was more complicated. Although with a good knowledge of their complex anatomy it was possible to visualise them separately. The cunean tendon was the most obvious, running distomedially. During the lateral approach, the lateral digital extensor tendon and collateral ligament (straight and oblique part) could consistently be visualized. The oblique part of the collateral ligament consistently contained hypoechoic areas (artefacts) due to the waving pattern of the fibres. During the medial approach, the collateral ligament (straight and oblique part) could consistently be visualized as well as the flexor digitorum medialis tendon. The oblique part was thicker and contained no artefacts comparing to the oblique part of the lateral collateral ligament. During the plantar approach, all expected structures could be consistently visualized. The tarsal sheath contained a small amount of fluid in two legs. During the three first steps, using the talar ridges as reference structures, the other anatomical structures could be easily localised.

Discussion/Conclusions: Most of the tarsal joint structures can be consistently visualized during a routine examination of the tarsal joint. Scanning the collateral ligaments and plantar ligament needs moderate training while the evaluation of the insertions of the peroneus tertius and tibialis cranialis muscles and the bursae and tendon sheaths requires an accurate knowledge of the anatomy.

COMPARATIVE IMAGING OF A CHRONIC INJURY OF THE HIND FETLOCK OF A RACING FRENCH TROTTER. S. Jacquet, F. Audigié, D. Didierlaurent, J.M. Denoix, CIRALE-IPC, Ecole Nationale Vétérinaire d'Alfort, RN 175 - Goustranville - 14430 Goustranville - France

Introduction: On nuclear scintigraphic examination, increased radiopharmaceutical uptake (IRU) of the metatarsal condyle is frequently detected on racing trotters presented with a history of hindlimb lameness or poor performance. But in most cases radiographic and ultrasonographic examinations fail to reveal any significant abnormality. The purpose of this poster is to illustrate the interest of Magnetic Resonance Imaging (MRI) examination in a horse showing a chronic hindlimb lameness with marked IRU on the hind fetlock and no significant abnormal radiographic or ultrasonographic finding.

Material and Methods: A 6-year-old French Trotter male showed an acute onset of right hindlimb lameness with a radiographic diagnosis of a short midsagittal stress fracture of proximal phalanx (PI). After 4 months of rest the horse resumed training. As a right hindlimb lameness was still observed, the horse was referred for nuclear scintigraphic and MRI examinations. Upon presentation 7 months after the first onset of lameness the horse showed a mild right hindlimb lameness (grade 1/5) at trot on straight line, with a positive flexion test.

Results: Radiographic examination of the right hind fetlock (lateromedial, flexed lateromedial and dorsoplantar views) revealed a complete healing of the fracture with a persistent focal subchondral bone sclerosis of the proximogittal part of PI. Nuclear scintigraphic examination showed a marked IRU at the level of the plantar aspect of the metatarsal condyle and the proximolateral part of PI. MRI examination was performed under general anesthesia using a low field (0.2 T) magnet. T1- and T2-weighted sequences showed a small sagittal area with decreased signal of the proximoplantar part of PI (compatible with mild sclerosis), without fracture line. Two areas of marked signal abnormalities were identified on the plantar part of the medial metatarsal condyle. Decreased signal on T1- and T2-weighted sequences, compatible with sclerosis, was observed on the deep part of the condyle. In contrast, an area of clearly decreased signal on T1-weighted with isosignal on T2-weighted and increased signal on inversion-recovery sequences (STIR) was identified on the subchondral bone of the plantar aspect of the condyle. These last findings are indicative of bone-edema like lesion. Ultrasonographic examination of the fetlock under flexion was performed after MRI. It showed mild subchondral bone remodeling and thinning of the articular cartilage of the distal part of the metatarsal condyle. The diagnosis was a complete healing of the midsagittal stress fracture of PI and a bone contusion of the plantar aspect of the medial metatarsal condyle.

Discussion/Conclusion: Nuclear scintigraphic examination is the technique of choice to detect inflammatory bone conditions. But MRI is a powerful adjunct imaging modality to identify precisely the extent and type of the lesion generating the IRU. In this case MRI examination was essential to confirm the presence of a chronic bone injury of the metatarsal condyle without stress fracture and the complete healing of PI stress fracture. Such information is very useful to select the appropriate management of the horse.

EVALUATION OF TRAUMATIC INTRACRANIAL HEMORRHAGE USING CT AND MRI IN DOGS. Y.W. Lee¹, H.J. Choi¹, S.M. Jeong¹, K.J. Lee¹, S.K. Kang¹, H.C. Lee², D.W. Chang³, K.D. Eom⁴, J.H. Yoon⁵, K.C. Lee⁶, H.J. Park⁷, ¹College of Veterinary Medicine, Chungnam National University, Daejeon, 305-764, ²College of Veterinary Medicine, Gyeongsang National University, Jinju, 660-701, ³College of Veterinary Medicine, Chungbuk National University, Cheongju, 361-763, ⁴College of Veterinary Medicine, Konkuk University, Seoul, 143-701, ⁵College of Veterinary Medicine, Seoul National University, Seoul, 151-742, ⁶College of Veterinary Medicine, Chonbuk National University, Jeonju 561-756, and ⁷Department of Veterinary Medicine, Cheju National University, Cheju 690-756, South Korea

Introduction: Head trauma and intracranial hemorrhage are common in both people and animals. Diagnostic tools of intracranial hemorrhage are computed tomography(CT) and magnetic resonance imaging(MRI). Survey radiographs were difficult to diagnosis of intracranial hemorrhage. CT and MR imaging provided information on localization and change of adjacent neural structures. This report describes the use of CT and MRI to evaluate four dogs with traumatic intracranial hemorrhage and reviews the MRI features of intracranial hemorrhage.

Materials and Methods: Traumatic intracranial hemorrhage was diagnosed in four dogs with history of head trauma. Survey radiography was performed in all of dogs. Four MRI studies and three CT studies were examined. CT of the cranium in transverse plane using brain window was performed with a thickness of 5 mm. All of dogs were verified by dorsal, sagittal, and transverse T1W and T2W MR images. After medical treatments, MRI of intracranial hemorrhage is reviewed in some dogs.

Results: There were no remarkable findings in survey radiography in four cases. On CT images, the lesions were hyperdense without enhancing after intravenous contrast administration in two dogs. There was no significant finding in CT of dog 4. On MR images, appearances of the lesions in two dogs were isointense (dog 2) or isointense with hyperintense rim (dog 1) on T1W images and hyperintense on T2W images. In dog 3 and 4, there were hypointense and hyperintense lesions on T1W and T2W images respectively. The lesions in four dogs were located in left intracerebral region, intracerebral and cerebellovestibular region, subdural space, and right cerebral hemisphere respectively.

Discussion: MR imaging and CT can be used in dogs to identify hemorrhagic lesions within the brain. Also CT and MR imaging are useful methods for diagnosis and predicting the prognosis of intracranial hemorrhage in dogs.

COMPARISON OF HEPATIC VX2-CARCINOMAS AFTER INTRAPORTAL AND INTRAPARENCHYMAL TUMOR CELL INJECTION: A COMPUTED TOMOGRAPHIC AND HISTOPATHOLOGICAL STUDY IN RABBITS. K.C. Lee, J.I. Lee, H.B. Lee, J.J. Ko, S.H. Shin, S.Y. Heo, J.H. Kim, M.R. Alam, I.H. Choi, N.S. Kim¹
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Rationale and Objectives: To investigate the computed tomographic and pathologic features of metastatic and solitary nodular hepatic tumor growth induced by implantation of VX2 carcinoma with intraportal and intraparenchymal approach by the week in rabbits.

Methods: Hepatic VX2 carcinomas were induced in 32 rabbits by infusion of 0.1 ml tumor tissue homogenate into mesenteric vein (n = 8) (Group 1) or direct inoculation of 1 mm size tumor cubes (n = 24) at two sites on left lobe (Group 2). The plain and dual-phase enhanced CT was performed in all the VX2 hepatoma models at day 10, 17, and 24 after tumor implantation consecutively. Immediately after every CT scanning, 2-3 rabbits were sacrificed for the histopathologic study. The enhancement patterns of CT were assessed and correlated with histopathologic features.

Results: The success rates of tumor growth were 100 % (8/8) and 87.5%(21/24) in Group 1 and 2 respectively. Forty to fifty tumors in each animal in Group 1 and a total of 41 tumors in the animal of Group 2 were observed and analysed. No animal was expired unintentionally except one rabbit in Group 2 due to non-recovery from general anesthesia after 1st CT scanning. In arterial phase CT images, Group 1 showed peripheral rim enhancement with targetoid appearance from day 17 after implantation and Group 2 revealed peripheral rim enhancement with central hypointense throughout the CT study. On portal venous phase, targetoid appearance was appeared more distinct without peripheral rim enhancement in Group 1 from day 17 after implantation and main body of the solitary tumors in Group 2 remains hypointense with wash-out pattern mostly (37/41) from day 17 after implantation. The targetoid appearance of Group 1 on CT images is compatible with the apparent papillary growth on pathologic findings representing a vascular core enhanced on CT.

Conclusion: Understanding of CT imaging characteristic in metastatic and solitary hepatic tumor model in rabbit could contribute critical information for investigating various VX2 carcinoma study in rabbit.

Key words: Metastatic tumor model, rabbit, VX2 carcinoma, computed tomography.

FLUID ACCUMULATION IN CANINE TYMPANIC BULLA: RADIOGRAPHY, CT AND MRI EVALUATIONS. H.J. Choi¹, Y.W. Lee¹, S.M. Jeong¹, S.K. Kang¹, K.J. Lee¹, S.Y. Choi¹, I.S. O¹, H.C. Lee², D.W. Chang³. ¹College of Veterinary Medicine, Chungnam National University, Daejeon, 305-764, ²College of Veterinary Medicine, Gyeongsang National University, Jinju, 660-701, and ³College of Veterinary Medicine, Chungbuk National University, Cheongju, 361-763

Introduction: Fluid accumulation within the tympanic bulla is an important diagnostic indicator of canine otitis media although its identification can be a challenge using traditional imaging technique like radiography. The purpose of this study was to compare radiography, computed tomography (CT) and magnetic resonance imaging (MRI) in the identification of fluid accumulation within canine tympanic bulla.

Methods: Unilateral tympanic bulla in 10 beagles were experimentally filled with blood or saline. Quantitative analysis of CT images was obtained by using Hounsfield unit (HU). MR signal intensity was obtained by using region of interesting (ROI) and compared with those of gray matter.

Results: On the CT images, the presence of blood or saline was identically seen as a fluid opacity occupying the tympanic bulla. However, CT numbers of blood in tympanic bulla were significantly high compared to those of saline ($p < 0.001$). On the MR images, the appearance of blood in the tympanic bulla was isointense in T1-weighted images and hyperintense in T2-weighted images. However, the appearance of saline in the tympanic bulla was hypointense in T1-weighted images and hyperintense in T2-weighted images.

Conclusions: The CT and MRI were more reliable methods than radiography in detection and differentiation of fluid in canine tympanic bulla. Especially, MRI allowed differentiation of fluid for gross evaluation. These results suggest that CT and MRI examination of the tympanic bulla has ability to assess the fluid accumulation and the differentiation of the fluid in the tympanic bulla.

CLINICAL ANATOMY OF THE CANINE BRAIN USING MAGNETIC RESONANCE IMAGING. E.Leigh, E.Mackillop, I.D.Robertson, L.Hudson. College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606

Introduction/Purpose: Magnetic resonance (MR) imaging is the modality of choice for brain imaging due to its superior soft tissue contrast resolution. For accurate interpretation of brain MR images, it is critical that the association between clinical signs and neuroanatomic localization be understood. The purpose of this study was to produce an MR image atlas of clinically relevant brain anatomy and to relate the neuroanatomy to clinical signs.

Methods: The brain of an 11 month old, neutered male, Great Dane was imaged in transverse, sagittal and dorsal planes using a 1.5 Tesla MR unit and the following pulse sequences: T2 (TR 4000 ,TE 91, 3.0 mm slice thickness, FOV 20 x 20 cm,,1 NEX, 256 x 256 matrix), T1 (TR 543 ,TE 12, 3.0 mm slice thickness, FOV 20 x 20 cm, 1 NEX, 256 x 256 matrix), and T2 weighted spatial and chemical shift encoded excitation sequence (SPACE), (TR 3500, TE 356, 3.0 mm slice thickness, FOV 23.7 x 23.7 cm, 256 x 256 matrix). A three dimensional, time of flight, fast imaging with steady–state precession (FISP), multislab sequence (TR 35, TE 7.1, 0.8 mm slice thickness, FOV 16.3 x 20.0 cm, 1 NEX, 208 x 256 matrix) was acquired to map arterial vascular structures. Images were reviewed using a DICOM workstation and manipulated with three dimensional reconstruction software. Relevant neuroanatomic structures were identified using anatomic texts, sectioned cadaver heads, and previously published atlases.

Results: Clinically relevant brain anatomy was identified on selected images in different planes. Major subdivisions of the brain were mapped and the neurologic signs and etiologies of lesions in these divisions were described. T2, and T1 weighted protocols each contributed useful anatomic information, however T2 weighted images were the most useful for identifying clinically relevant neuroanatomy. Using a 3.0 mm slice thickness reduces volume averaging and allows for detection of smaller structures, however these advantages must be weighed against decreased signal to noise. 3D volumetric reconstruction software provided gross identification of arterial vascular structures (maximum intensity projection) and external brain morphology.

Discussion/Conclusion: The above mentioned sequences were selected from those commonly used in clinical practice. These sequences provided excellent neuroanatomic correlation enabling easy identification of clinically relevant brain morphology. Relating clinical signs to morphology as seen on MR will assist clinicians and residents in training to better understand clinically relevant neuroanatomy in MR images.

NORMAL PULSED-WAVED DOPPLER ULTRASONOGRAPHY OF ABDOMINAL AORTA IN RABBITS. M. Masoudifard, A.R. Vajhi, S. Soroori, S. Asadzadeh Manjili. Faculty of Veterinary Medicine, University of Tehran, P.O.Box: 14155-6453, Tehran-Iran.

Introduction: Rabbit is used as an animal model in different vascular researches including ischemia of limbs vessels, effect of anti-thrombosis drugs, experimental stenosis of aortic valve, experimental studies of renal vasculature and etc. Doppler ultrasound can provide important information about vascular problems through the analysis of blood flow waveform. Reports on the normal Doppler flow velocity parameters of rabbit vascular system are limited. The purpose of this study was obtaining the normal spectral blood flow waveform of abdominal aorta using pulse-wave Doppler ultrasonography and estimation of flow velocity parameters in rabbits.

Methods: Abdominal aorta arteries of eight healthy New Zealand White rabbits with average weight of 2.03 kg were evaluated using a Voluson 730 Pro ultrasound machine. After clipping the abdomen and finding the anatomic location of the artery using color Doppler, pulse-wave Doppler was activated and spectral Doppler images of the artery were obtained. Values of peak systolic velocity (PSV), end-diastolic velocity (EDV), mean velocity (MnV), resistance index (RI) and pulsatility index (PI) were measured.

Results: Spectral waveform analysis of pulsed Doppler of abdominal aorta revealed almost high-resistance flow pattern with triphasic flow and plug velocity profile. Mean \pm SD of PSV, EDV and MnV were 85.3 ± 19.50 , 23.6 ± 6.05 and 37.3 ± 8.56 cm/s, respectively. Mean \pm SD of RI and PI were 0.71 ± 0.04 and 1.65 ± 0.28 .

Discussion: High heart rate of rabbits may influence calculation of EDV and RI; at increasing heart rate, the systolic upstroke occurs earlier on the declining diastolic velocity curve, resulting in an increase in the EDV and decrease in RI. Results of this study may be useful as normal findings in hemodynamic evaluation of abdominal aorta and evaluation of diseases such as thromboembolism and arterial stenosis in rabbits.

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ULTRASONOGRAPHY AND CT OF THE EUROPEAN EEL: POTENTIAL APPLICATIONS IN REPRODUCTIVE MANAGEMENT. F.J. McEvoy¹, J. Tomkiewicz², H. Jarlbæk² and E. Svalastoga¹. ¹Royal Veterinary and Agricultural University, Copenhagen, Denmark ²Danish Institute for Fisheries Research, Charlottenlund, Denmark

Introduction: The population of *Anguilla anguilla* (European eel) has declined steeply since the 1980's partly due to recruitment failure. Natural reproduction of this species remains largely unknown and successful rearing of larvae from artificially induced spawning in captive fish has not been achieved. As part of a large project aimed at the production of viable larvae, ultrasound and CT were used to trace changes during hormone induced ovarian maturation. Ultrasound has been used for similar applications in carp and salmon. The aim of the study is to identify features that can be used to assist in determining the optimum time for induction of ovulation and collection of oocytes for subsequent fertilization.

Material and Methods: From a large study, 2 different groups, each of 55 mature female eels, were imaged by ultrasound. Group differences related to nutrition and treatment with salmon pituitary glycoprotein fraction (SPG) and dihydroxy-progesterone (DHP). Five eels from each group were scanned once weekly for around 11 weeks, allowing sampling throughout the maturation period. Imaging was followed by dissection and tissue collection. Using a 14 MHz linear array transducer, transverse images at the level of the cloacae and at 3 cm intervals cranially were obtained. From these ovarian diameter and body wall thickness were measured. The appearance of bowel was noted. Initially, image evaluation was assisted by CT examination and/or dissection.

Results: Preliminary results indicate that ovarian tissue is visible from the period of the initial scan to the final scan. At particular sites, this occupied from 10% of cross sectional area at the onset of scanning to 67 % of cross sectional area at the end of the scanning period. Intestinal loops were evident in images collected at the commencement of treatment but these regressed and were not evident in eels at the conclusion of the treatment period. Body wall thickness showed a 40% reduction during the scanning period.

Discussion: While the ovaries were clearly identifiable at all scanning periods, individual oocytes were not resolved. Changes in intestinal appearance and body wall thickness were expected during the scanning period as atrophy of the intestine and mobilization of fat reserves from the body wall in the period prior to ovulation has been reported. Ultrasound allows non-invasive measurement of the ratio of ovarian to whole body cross sectional area. A gonadosomatic ratio calculated from the weight of ovary to all other tissues has been useful in monitoring optimal spawning times in other species including the Japanese eel. It remains to be seen if a similar role can be found for the ratio determined non-invasively by ultrasound in this study.

MAGNETIC RESONANCE IMAGING CHARACTERISTICS AND DETECTION OF AN AUTOANTIBODY IN THE CEREBROSPINAL FLUID (CSF) WITH SUSPECTED NECROTIZING MENINGOENCEPHALITIS (NME) IN ELEVEN DOGS. T. Nakade¹, N. Matsuki², A. Inoue¹, H. Taniyama³. ¹Department of Small Animal Clinical Sciences, School of Veterinary Medicine, Rakuno Gakuen University, Ebetsu, Hokkaido 069-8501, ²Department of Veterinary Clinical Pathology, Graduate School of Agricultural Life Sciences, The University of Tokyo, Tokyo 133-8657 and ³Department of Veterinary Pathology, School of Veterinary Medicine, Rakuno Gakuen University, Japan.

Introduction/Purpose: Magnetic resonance image (MRI) equipment has been introduced in veterinary medicine recently; the inflammatory encephalitis was diagnosed in clinically. Cordy et al. reported the canine NME histopathologically in 1989. But the accurate causes had not made clear yet. According to MRI findings, cerebrospinal fluid (CSF) findings and presence of an autoantibody against astrocytes, the 11 dogs were strongly suspected NME. The purpose of this study was therefore to describe the MRI characteristics and detection of an autoantibody against astrocytes in CSF with canine NME.

Material and Methods: Eleven dogs, six Yorkshire terriers, two Chihuahuas, one Pug, Shi-zu and Miniature pinscher, with convulsive seizure, melancholia, change of character and ataxia have a MRI examination and CSF analysis from March to October 2005. MRI of the brain was performed with a low tesla (0.2T) magnet under sevoflurane inhalation anesthesia in all dogs. The dogs were positioned in dorsal recumbency and scanned using a phased array wrist or extremity coil. Transverse T2-weighted (W), plain and postcontrast T1-W and T2 fluid-attenuated inversion-recovery (FLAIR) images were obtained in all dogs. CSF were obtained from cisternal puncture, and analyzed and detected an autoantibody against astrocytes in CSF by indirect fluorescence assay.

Results: Age of the dogs ranged from 6 months to 6 years old (mean=3.9 years old). Clinically, vision disturbance (81.8%), proprioception abnormality (81.8%), circling (63.6%), torticollis (45.5%), seizures (54.5%) and change of character (27.3%) were observed. T2W and T2 FLAIR showed hyperintense lesions and in the parietal, temporal, and frontal lobe, mainly. T1W revealed hypointense lesions in the same regions. There is a slightly enhancement after administration of gadolinium in some cases. These MRI brain lesions of the four cases were seen in the brain stem (three Yorkshire terriers) and cerebellum (one Chihuahua). An autoantibody against astrocytes in CSF by indirect fluorescence assay was detected in the eight cases (72.7%). There is no detection in two cases (18.2%), and one case had an autoantibody against the vessel of the cerebrum (9.1%). All cases were treated by prednisolone alone or with cyclosporine. Two mg/kg of the prednisolone plus 6 mg/kg of cyclosporine were effective for the treatment without one Pug and one Yorkshire terrier.

Discussion/Conclusions: MRI was very helpful to suspect the NME in clinically and to judge the efficacy of the treatments. In consideration of the over 70 % detection of autoantibody against astrocytes in CSF, this autoantibody may be as a clinical diagnostic marker. Further comparative studies using many cases with NME were needed.

COMPUTED TOMOGRAPHY OF THE HEAD AND CRANIAL NECK IN THE STANDING SEDATED HORSE. A.H. Nelson Rainbow Equine Clinic, Old Malton, North Yorkshire YO17 6SG UK

Introduction: Computed tomography of the head in the horse is helpful in the investigation of sinus and tooth disorders in the horse. A human CT gantry was adapted to perform scanning of the horses's head and cranial neck in the standing sedated horse.

Materials and Methods: A single slice helical CT scanner (Toshiba Xpress GX) was adapted by placing the table on the opposite side of the gantry. The horse is walked down a ramp and stands on a platform which is mounted on air skates. The platform and CT table are linked so that the whole horse moves with the CT table the head is rested on the CT table and plain and post contrast scans performed after the injection of non-ionic contrast media. The handler is over 2m away from the gantry and positioned behind a lead screen away from the main axis of the gantry.

Results: 20 horses have been scanned (January 2006) for a variety of presenting complaints including nasal discharge, head shaking, Horner's syndrome, and problems with jaw opening. Diagnostic images were obtained in all cases and imaging took approximately 30 minutes from sedation to the horse leaving the scanning room. No side effects were noted following injection of contrast. Monitoring of radiation dosage using an EPD did not register any readings above background during the procedure for the handler.

Discussion/Conclusion: This study demonstrates the feasibility of obtaining diagnostic CT images of the head of the standing sedated horse without compromising radiation safety of handlers.

FUNCTIONAL RENAL IMAGING IN CATS USING ^{99m}Tc-DMSA.

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Introduction/purpose: The aim of the study was to evaluate the influence of the cat's positioning on the results of ^{99m}Tc-DMSA renal scintigraphy.

Methods: Twenty one cats were included in this study, varying in age from 8 months to 14 years. Three cats had chronic renal problems, respectively renal insufficiency, hydronephrosis and calculi in the renal pelvis. After the intravenous administration of Tc-^{99m} DMSA at an average dose of 145 MBq, 40 second static renal images were acquired at 2, 4 and 24 hours, each time under a short anesthesia (Propovet® induction, Isoflo® maintenance). Ventro-dorsal and dorso-ventral images were acquired, with the cat successively in prone and in supine position. Dorso-ventral images were also obtained with the animals in left and right lateral recumbency, the head of the gamma camera being positioned vertically. The images obtained in these different positions were then displayed and compared. The left to right uptake ratio was also quantified by drawing regions of interest around the kidneys, but the results are out of the scope of the present paper.

Results: Dramatic changes in the respective position of both kidneys were observed, depending on the position of the animal. The best separation of both kidneys was obtained using the supine position. In prone position, and even more in lateral position, it became difficult – if not impossible – to separate adequately the two kidneys and thus to quantify the relative function. This is due to the anatomy of a cat, the kidneys being fixated very loosely in the retroperitoneal cavity. Therefore, changing the position of the cat implicates that the position of the kidneys also changes.

Conclusion: The supine position is the only one allowing to separate adequately the two kidneys. Prone and lateral position should be avoided when anatomy or function of the kidney has to be evaluated with scintigraphy.

EFFECT OF WEIGHT GAIN ON BONE MINERAL DENSITY IN BEAGLES

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Introduction/Purpose: Obesity is a common condition in canines and humans that has been associated with many other health problems. Osteoporosis is a significant medical problem in humans, particularly in the elderly and postmenopausal women. Weight loss in obese postmenopausal women has been associated with decreasing bone mineral density (BMD), thereby increasing the risk of osteoporotic fractures. This study investigated the changes in BMD in Beagle dogs on a high calorie diet.

Materials and Methods: Eighteen, normal, 1-2 year-old, ovariectomized Beagles were fed a commercial dog food for 5 weeks that was designed to maintain their body weight and condition. Body weights (BW) were recorded weekly. Computed tomography (CT) studies were acquired from the thoracic inlet to the tarsi with dogs positioned on a hydroxyapatite BMD phantom pad at wk 5. Diets were gradually increased in caloric content for 8 wks then maintained at this elevated caloric content for 5 wks. CT scans were repeated at wk 18. Quantitative CT was used to measure vertebral and appendicular BMD. Body weight over time was analyzed by means of SAS PROC MIXED as a two factor mixed ANOVA. Each weekly weight was compared to the initial weight by means of Bonferroni t test for multiple comparisons. A value of $p \leq 0.05/m$, where m =number of comparisons back to time=0, was considered significant. Pre (wk 5) and post (wk 18) BMD data were analyzed by a paired t test with a significant value of $p \leq 0.05$.

Results: All 18 dogs gained body weight from wk 11-18 (mean 1.67 kg \pm 0.11 kg; $p < 0.0001$). Vertebral body BMD increased in three thoracic vertebrae, (T3 ($p=0.011$); T4 ($p < 0.001$) and T13 ($p=0.019$)), in all lumbar vertebrae (L1 ($p=0.002$); L2 ($p=0.026$); L3 ($p=0.024$); L4 ($p=0.041$); L5 ($p=0.030$); L6 ($p=0.008$); L7 ($p=0.016$)) and in the right olecranon process ($p=0.017$). BMD decreased in both humeral necks (left ($p=0.002$); right ($p=0.007$)), in the right humeral diaphysis ($p=0.046$), in the left proximal radius ($p=0.020$), and in both femoral necks (left ($p=0.002$); right ($p=0.000$)). All other thoracic vertebral and appendicular sites tested showed no difference in BMD.

Discussion/Conclusion: In female ovariectomized Beagles, an increase in body weight is associated with an increase in vertebral BMD and a decrease in appendicular BMD. The increase in weight carried by the skeleton may have stimulated the increase in vertebral BMD, however this does not account for the decrease in appendicular BMD. The effect of supplemental weight carrying and the effect of weight loss on axial and appendicular BMD and fat distribution in dogs are the next steps in further investigation of the association between body condition and BMD.

ULTRASOUND-GUIDED PERCUTANEOUS NEPHROSTOMY IN DOGS

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Introduction: The technological development of imaging equipment has allowed for the improvement of pre-existing procedures and for the creation of new options in treatment, mainly in the application of urinary treatment, by introducing minimally invasive techniques. Hydronephrosis often originates from the partial or complete obstruction of the urine flow and it can affect one or both kidneys, causing dilation and progressive functional impairment. When renal function is evidenced by exams such as the excretory urography or scintigraphy, it becomes vital to recover the kidney with hydronephrosis, especially if the other is damaged. Urinary drainage by echo-guided percutaneous nephrostomy promotes immediate relief of intrarenal pressure, diverting the urine flow when its habitual trajectory is damaged. Furthermore, temporary drainage can be utilized, providing time for an adequate diagnosis and therapeutic planning or even avoiding or postponing a surgical alternative of greater dimension and higher risk. The aim of this study was to describe and adjust the percutaneous nephrostomy technique, using ultrasound as a real-time guide to insert a catheter into the dilated pelvis.

Methods: The procedure was performed on eight adult dogs, of both sexes, weighing between 10 and 17.5 kg, with unilateral hydronephrosis produced experimentally. The Seldinger and direct insertion techniques were used for the introduction of a pigtail catheter.

Results: The confirmation of the insertion of the catheter into the kidney was carried out by the infusion of a 30 per cent diluted iodine contrast medium according to the percutaneous antegrade pyelography. Washing with sterile saline solution through the catheter impeded the interruption of the urine flow by clots after the insertion.

Conclusion: The technique demonstrated satisfactory results in urinary drainage, proving to be a quick, efficient and safe alternative in the treatment of hydronephrosis in dogs.

Key-words: hydronephrosis, percutaneous drainage, catheter pigtail.

ANIMAL'S BONES MICROSTRUCTURE ANALYSIS. N.A. Slesarenko, R.F. Kapustin*. Department of Animal Anatomy, Moscow State Academy of Veterinary Medicine and Biotechnology named after K.I. Skryabin, ul. Akademika Skryabina, 23, Moscow, Russia, 109472, *Department of Animal Morphology, Belgorod State Agricultural Academy, ul. Vavilova 1, Maiskii Belgorodskoi oblasti, Russia, 308503

Introduction: The invention offered by us is to the point to agriculture, especially to veterinary and it can be used for object analysis of bone tissues of different kinds of animals, it will depend on their dwell, maintenance, feeding and other factors, for example, for objective exposure of functional and morphological changes of animals' bone system, being in hypodynamical conditions, in comparison with animals, being in nature byocynosis. The aim of this invention is providing with possibility of quality and quantity differentiation of main structure components of all value of bone simultaneously. The rose aim is reached, according to the method of destroy exposure of animals' bone microstructure, the analyse of rentgenogrammes is realized by colour deciphering their optical density and measuring of representation area of all bone and area rentgenogramme, coloured by separate fixed colour, corresponding with bone structure densities, and due to distribution one judge about quality and quantity differences structure of animals' bones.

Method: Different investigated bones of compared animals are x-rayd, passing x-ray on x-ray film with determined ability. Deciphering of obtained rentgenogrammes is worned by blackness of analogue or discreted color encoder. In descreted colour regime of deciphering work make the colour deciphering of black-white rentgenogrammes of investigated bone. During this process any colour answers the purpose of found, optical density of rentgenogrammes blackness, i.g. amplitude of black white sing transforms in 8 fixed colours: red, blue, purple, green, yellow, limon, and white. Any of these colours answer the purpose the density of investigated area of bone trissues. Here the colours are present in order of density decrease. Proceeding from known accordance of any colour of bone tissue density, one can make detailed comparative characteristic of studied bone structures on deciphering rentgenogramme we measure the area of all bone and the areas of parts of different colours of bone rentgenogramme. The measuring of these areas is bone with help of PC, as well as it can be make on scale graticule from control device screen or by topography planemetre. Obtained figures are worked up, for example, building hystogramme of density distribution of bone structure. The availability of colour gamut showing density of studied bones and value which find the presence conformable colour in gamut, let to make up comparative analyse of colour and, thus, to carry out the comparative analyse of density of bone structure.

Results/Discussion: Thus, offered method gives possibility, at first, to make analyse the density of all bone value, and at second, it is based on objective criterion, where comparative figures are expressed by quantity. Reliable and objective determination of quantity senses for main structure components of bone matter lets make up comparative rentgenogrammometric estimation of different bones not only by posthumous analyses of macroparameters, but during the growing and development of animals. This method lets get intrascopic information about bone matter without breach of its integrity. The priority of work has been corroborated by Federal Service of intellectuale property, of patent and goods sing of Russia Federation.

COMPARISON OF TWO DIFFERENT ORIENTATIONS OF THE TRANSVERSE AND DORSAL IMAGES FOR MAGNETIC RESONANCE IMAGING OF THE EQUINE FOOT. M.P. Spriet, New Bolton Center, University of Pennsylvania, PA 19348, USA.

Introduction: Magnetic resonance imaging (MRI) of the equine foot has commonly been described with transverse images being “perpendicular to the palmar cortex of the navicular bone” and dorsal images being “parallel to the dorsal cortex of the middle and distal phalanges”. We have noted that the collateral ligaments (CL) of the distal interphalangeal joint (DIPJ) cannot be ideally assessed in this configuration. An alternative configuration, with a transverse plane parallel to the sole and a dorsal plane aligned with the long axis of the collateral ligaments of the DIPJ, may allow better assessment of these ligaments. It is, however, likely that this second configuration is less optimal to assess other anatomical structures. The objectives of this study were to compare these two configurations for the MRI evaluation of the different anatomical structures of the equine foot.

Methods: An isolated thoracic foot from a skeletally mature horse, with no known history of lameness, was imaged using a human knee radiofrequency coil in a 0.25 T magnetic field (ESAOTE G-scan) in two different configurations. In configuration 1, the transverse plane was “perpendicular to the palmar cortex of the navicular bone” and the dorsal plane “parallel to the dorsal cortex of the middle and distal phalanges”. In configuration 2, the transverse plane was parallel to the sole and the dorsal plane was aligned with the long axis of the collateral ligaments of the DIPJ (slightly oblique in a palmaro-proximal to dorso-distal orientation from the plane perpendicular to the sole). Transverse and dorsal images were obtained using a 3D Gradient Echo (GE) T1-weighted pulse sequence, which was chosen among other MRI pulse sequences for providing good anatomical detail. The quality of visualization of the deep digital flexor tendon (DDFT), the distal sesamoidean impar ligament (DSIL), the collateral sesamoidean ligaments (CSL), the navicular bone and the CL of the DIPJ was assessed. The way these structures were imaged (long axis, short axis or oblique cross-section), and the conspicuity of their margins, were compared between the two configurations.

Results: The transverse plane in configuration 1 allowed good visualization of the palmar surface of the NB and of the DDFT palmar to the NB, whereas the assessment of the CL of the DIPJ was improved with configuration 2. The dorsal plane in configuration 1 did not allow adequate assessment of any of the ligaments or of the DDFT. With the dorsal plane in configuration 2, good visualization of the CL of the DIPJ, in a long axis, and of the distal part of the DDFT and DSIL, in a short axis, was obtained.

Conclusions: There are pros and cons for both transverse plane configurations, with regards to evaluation of anatomic structures. Therefore the choice of the transverse plane orientation may depend on the anticipated lesion(s). The dorsal plane aligned with the long axis of the CL of the DIPJ provides more information than the other configuration and should be preferred in a standard examination.

ULTRASONOGRAPHIC GUIDED INTRA OVARY INJECTION OF DESTRUCTING AGENTS FOR STERILIZATION OF FEMALE DOG. A.R. Vajhi, M.M. Shahi Ferdous, M. Masoudifard, H. Ghasemzadeh-Nava, J. A. Helan, M.M. Dehghan Faculty of Veterinary Medicine, University of Tehran, Tehran-Iran. P.O.Box: 14155-6453.

Introduction: Nowadays, removing of ovary in female dogs is a recommended operation to prevent unwanted pregnancy and problems related to the estrous including discharges, polyuria, unwanted sexual intercourses and reducing mammary tumors. Removing ovary, according to the traditional ovariohysterectomy (OHE) and even according to the new ways of laparoscopy which are recently done, accepts the usual risks in all operations. The purpose of this study was to introduce ultrasonographic guided intra-ovary injection (UGOI) of destructing agents as a suitable and non-invasive method for destruction of ovary in dog, instead of common ways of removing the ovaries.

Materials and Methods: Two groups of 6 female dogs (3 mature and 3 immature) were chosen. Before the operation, the amount of serum progesterone was evaluated in order to recognize the activity of ovary. After tranquilization of the dog and shaving of the abdomen, the ovaries were scanned using ultrasonography set (Voluson 730 Pro) and linear probe 6-12 MHz. UGOI of 1ml of %10 Iodine-Tincture as a destructing agent using guide device and spinal needle was performed bilaterally under aseptic conditions. 10 days after injection, the amount of progesterone in serum was again measured and histopathologic sections of each ovary were evaluated after ovariectomy (OVE) to assess the reliability of the procedure in destruction of ovarian tissues.

Results: Scanning the ovaries and UGOI of destructing agent were achieved using the high quality ultrasound machine, and it could be done less than 10 minutes for each ovary, however, the time is operator dependent. Serum progesterone levels were >0.5 and <0.4 ng/ml in mature dogs before and after UGOI, respectively. After 10 days, no adhesion was found in the abdomen as well as in the injection site during OVE operation. Macroscopically, the ovaries were round in shape, creamy to reddish brown in color and foci in cortex visualized that seemed to be hemorrhages or necrosis. Histopathologic examination revealed extensive hemorrhages inter cortex and medulla and slight fibrosis with presence of active fibroblasts.

Discussion: Currently, the OVE and OHE are recommended for sterilization of female dogs. UGIOIT is introduced as a new technique for destroying of the ovarian tissues. It is a fast, safe, much less adverse effect and reliable method to sterilize the animal as a substituting technique for OVE and OHE. Further investigation is recommended for evaluation of prolonged effects of this technique on animals and to assess the application of UGOI in treating the ovarian diseases.

DOPPLER IMAGING OF THE ORBITAL VASCULATURE OF THE NORMAL PUPPY GERMAN SHEPHERD DOG. Vosough D, Masodifard M, Faculty of Veterinary Medicine, University of Bahonar, Kerman - Iran.

Introduction: Blood velocity parameters of the orbital and ocular vasculature can be noninvasively assessed and measured by Doppler imaging. For convenience the ophthalmic vasculature was divided into the orbital blood vessels and the ocular blood vessels. The purpose of this study was to blood velocity measurement in orbital vasculature.

Methods: A total of 8 (4 males and 4 females) previously healthy puppy German shepherd dogs. General Electrics Voluson 730-Pro ultrasound equipment with linear trapezoid 5-12 MHz transducer was applied for all the examinations. Vessels identified a majority of the time, include: external ophthalmic artery (EOA), dorsal external ophthalmic vein (DEOV), ventral external ophthalmic vein (VEOV), and internal ophthalmic artery (IOA) and the following Doppler parameters were measured, peak systolic velocity (PSV), end diastolic velocity (EDV), resistive index (RI). All the obtained data were analyzed in males and females dogs by paired sample T-Test statistically

Results: Mean PSV, EDV, and RI at the EOA were 16.3, 6.1, and 0.601 and the mean PSV, EDV, and RI at the IOA were 18.3, 6.5, and 0.607 and mean PSV and EDV at the DEOV were 12.1 and 7.2 and mean PSV and EDV at the VEOV were 11.2 and 8.2. There wasn't a significant difference between male and female dogs about blood velocity measurement.

Discussion: Doppler imaging has the potential for determining noninvasively and consecutively the blood velocity parameters found in orbital and ocular diseases, including orbital inflammations and neoplasia; intraocular inflammations and neoplasia; vascular diseases including systemic vascular disease (hypertension) vasculopathies, and anemia; the glaucoma; and documentable follow-up after medical and surgical treatment of these diseases.

POSSIBILITY OF THE USE OF THREE DIMENSION ULTRASOUNDS AND MEASUREMENT OF OPTICAL ALONG AXIS OF GERMAN SHEPHERD DOG.

Vosough D, Masodifard M, Molazem M , Faculty of Veterinary Medicine, University of Bahonar, Kerman - Iran.

Introduction: In the last 10 years three-dimensional ultrasonography has been increasingly used as a diagnostic tool in human medicine but it is not common in veterinary practice yet. Therefore the purpose of this study was to evaluate the possibility of taking three dimensional (3D) ultrasound images for better visualization of canine eye and also taking the normal values of the optical a long axis by using this technique.

Methods: A total of 16 (8 males and 8 females) previously healthy 2 years old German shepherd dogs. General Electrics Voluson 730-Pro ultrasound equipment with “3D small parts” option of a 3D and 4D linear trapezoid 5-12 MHz transducer was applied for all the examinations. Ultimately the normal values of the optical long axis were measured from a line between cornea and optic disc in males and females, lefts and rights. All the obtained data were analyzed by paired sample T-Test statistically.

Results: The 3D ultrasonography method was found to be suitable for ophthalmic purposes. The relationships and connections between vitreous membranous, retina, and ocular wall are finely displayed and due to the stored 3D ultrasound tissue information, it was simple to be analyzed. In the obtained 3D images, vitreous body, posterior and anterior chambers of the eyes showed distinct echogenesity which were hapoechoic structures. The values of the optical long axis in obtained 3D images were measured. There was a significant difference between male and female dogs but there was not any between left and right eye as it was expected ($p < 0/05$).

Discussion: Different scanning methods could be applied for 3D data acquisition. The 3D data acquisition time required 5-10 seconds depending on the selected 3D box size of the interested region and also the desired image quality. It was so fast that a real-time 4D reconstruction could be performed too. Axial ocular length is significantly longer in the human male than the female. This was also found in the dog, but a later independent study reported no significant difference..Dolichocephalic breeds have a longer glob than do mesocephalic breeds. In veterinary medicine, ocular biometry can be used in establishing lens implant size, calculating lens power, and estimating prosthetic globe size after enucleation.

CANINE BLADDER TRIGONE DIVERTICULUM. W. M. Wagner, B. Meyers. Faculty of Veterinary Science, University of Pretoria, Private Bag X04, Onderstepoort 0110, South Africa.

Introduction/Purpose: Diverticula of the bladder are pouch-like inversions or invaginations of the bladder wall, arising either as congenital defects or acquired lesions. Congenital and acquired bladder diverticula are uncommon abnormalities in the small animal patient. Three types of bladder diverticula exist in the canine and feline patient: 1) traumatic bladder diverticula, 2) vesicourachal diverticula, mainly in the feline patient, and 3) trigone bladder diverticula. Bladder diverticula in the dog and cat have been well described as a result of urachal abnormalities. These however occur at the apex of the bladder. Both previously described canine bladder trigone diverticula were assumed to be of congenital origin, and occurred in young intact male German Shepherd dogs. Both were clinically silent, and only presented because of secondary complications. In humans, bladder diverticula are located in the apex and trigonal area and are most common in adult men (acquired), less common in boys (congenital) and rare in females.

Methods: A 5-month-old intact male Rottweiler was presented to the Onderstepoort Veterinary Academic Hospital for intermittent urinary incontinence, which was particularly noticeable after lying down. There were no obvious abnormalities apparent on clinical and neurological examination. Urine collection via cystocentesis showed no abnormalities. A full hematology and biochemical profile showed a mild mature neutropaenia and mild lymphocytosis, which was thought to be non-significant.

Results: A trigone bladder diverticulum could be demonstrated by contrast radiography, ultrasonography and computed tomography, and emphasized the importance of positional diagnostic imaging.

Discussion/Conclusions: Since there was no history of a traumatic insult, or outflow obstruction and considering the young age of the animal, a congenital origin was assumed. Contrary to the numerous reports on urachal diverticula in the veterinary literature, there have only been two other canine bladder trigone diverticula described. These were considered to be of congenital origin by the authors. Both canine patients were also young (9 and 14 months old) and intact males. However, they were both German Shepherd dogs, with one having multiple diverticula. Results of excretory urography may be entirely normal without revealing the presence of a diverticulum because the latter may not fill with contrast medium or the urine residual within the diverticulum may dilute the contrast material sufficiently to obscure its presence. In this case, the bladder diverticulum could be nicely visualized, because negative contrast medium was inserted prior into the bladder and hence enabled to visualize the bi-compartmental appearance ("hunchback double bladder"). Taking the young age of the patient into consideration and since there was no history of traumatic insult and outflow obstruction, a congenital diverticulum was assumed. Unfortunately no histopathology was obtained. Even though there is a similarity to the human literature, some differences exist to the reported canine bladder trigone diverticula, which are extremely rare. This case also emphasizes the importance of positional diagnostic imaging procedures and is the first report describing CT findings in a canine bladder trigone diverticulum.

ADVANTAGES AND DISADVANTAGES OF FLAT-PANEL VOLUMETRIC COMPUTED TOMOGRAPHY (fpvCT) COMPARED WITH CONVENTIONAL CT IN VETERINARY MEDICINE.

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Introduction: Flat-panel volumetric Computed Tomography (fpvCT) is a relatively new technique in which flat-panel detectors (FPDs) are used for imaging. FPDs allow the acquisition of a larger volume of a subject in a shorter time than with a conventional Computed Tomography (CT). Compared with a conventional CT the images acquired with a fpvCT are of an isotropic resolution which provides better images concerning three dimensional reconstructions. The aim of this study was to determine the value fpvCT for clinical diagnosis in veterinary medicine and to compare it with conventional CT.

Material and Methods: 18 animals (including 11 dogs, 5 cats, one ferret and one guinea pig) have been examined with fpvCT, an experimental system developed by GE Global Research, Niskayuna, NY. The regions scanned included the tarsal joint for OCD lesions, the elbow and the carpal joint, the spine for herniated discs (Myelo-fpvCT), and the head, mainly for intranasal masses but also for the tympanic bulla, neoplasm of the maxilla or the mandible, in one case for evaluating multiple skull fractures after a car accident and for herniation of the cerebellum through the foramen magnum (Myelo-fpvCT). In cases of suspected neoplasms intravenous contrast medium (Solutrast 300 ®) had been given in a dose of 2ml/kg body weight.

Results: Compared with conventional CT the advantages of a fpvCT are: examination of a larger volume in a significantly shorter time, excellent high-contrast images (lung tissue, bone) acquisition of a 3-dimensional dataset in isotropic spatial resolution. Disadvantages: long detector readout time due to the large amount of data (approximately 9GB per rotation) obtained during one scan, poor low-contrast images (soft tissue).

Conclusion: FPDs provide an excellent condition for high-resolution imaging of high-contrast materials such as bone or lung tissue. However, the resolution for low-contrast material (soft tissue) is poor compared to images acquired with a dedicated CT scanner. In our opinion fpvCT appears useful in cases high-contrast images of very small subjects are required (e.g. Myelo-CT of a guinea pig or a ferret). The poor low-contrast resolution limits its value for other routine diagnostic purposes (e.g. evaluation of intranasal masses) that require an evaluation of the bone as well as of the soft tissues.

HISTOPATHOLOGIC STUDIES OF THE DISRUPTION OF MURINE TUMOR VASCULATURE BY MILD-INTENSITY ULTRASOUND. A.K.W. Wood,[‡] R.M. Bunte,^{*} S. Ansaloni,[†] W.M-F. Lee,[§] and C.M. Sehgal.[†] University Laboratory Animal Resources,^{*} Depts of Radiology [†] and Medicine, [§] University of Pennsylvania Medical Center, and Dept Clinical Studies (Phila), [‡] School of Veterinary Medicine, University of Pennsylvania, 3900 Delancey St, Philadelphia, PA 19104, USA.

Introduction: Angiogenesis provides the vascular supply to a growing neoplasm, however, the new blood vessels are fragile, leaky and not fully functional. They are disrupted by mild-intensity ultrasound. This study was aimed at defining the histopathologic changes that could explain the antivascular effects of mild-intensity ultrasound on tumor neovasculature.

Methods: In 27 mice (C3HV/HeN strain) a subcutaneous melanoma (K1735²²) was insonated (1, 2 or 3 min) with continuous mild-intensity, physiotherapy ultrasound (1 MHz; $I_{SATA} = 2.3 \text{ W cm}^{-2}$). B-mode ultrasonographic observations were made of the neoplasm before and after its insonation. Following each B-mode study, a contrast agent (0.1 mL Optison) was intravenously injected and the enhancement of power Doppler images was recorded on a videotape for quantitative analysis. The mice were euthanized either immediately or 24h after insonation and the tumor was removed for histopathology. A linear regression analysis was performed to establish whether there was a relationship between the % area of histological change and the % increase in tumor avascularity detected in the contrast enhanced power Doppler images.

Results: Analyses of contrast enhanced power Doppler observations showed that insonation significantly ($p < 0.005$) increased the avascular area in the neoplasm. Histologically, the untreated neoplasm was characterized by spindle shaped cells arranged in streams and bundles with unapparent vasculature. The predominant acute effect of insonation was an apparently irreparable dilation of the tumor capillaries with associated intercellular edema; other immediate effects were hemorrhage, and increased intercellular fluid. Liquefactive necrosis of neoplastic cells was a delayed effect. Pre-existing arterioles and venules were unaffected by the insonation. There was a high correlation ($R^2 = 0.91$) between the % area affected on histologic examination and the % increase in avascularity of the neoplasm in the Doppler study.

Discussion: Other workers have insonated endothelial cells growing in tissue culture and noted the presence of nitric oxide, a vasodilator, in the culture medium. Whether an ultrasound induced endothelial synthesis of nitric oxide caused the capillary dilation in our *in vivo* study requires further investigation. It appeared that the necrosis of the neoplastic cells was not related to a direct effect of ultrasound on the neoplastic cells, but rather to a generalized tumor ischemia following the acute effects of insonation on the neoplasm's capillaries. The observed bioeffects following insonation may be thermal in origin, however, other mechanisms including cavitation, radiation pressure and other non-linear effects should also be considered. Supported by NIH grant no. EB001713.

COARSE FRACTION CHEMORADIATION IN TREATMENT OF HEAD AND NECK NEOPLASIA IN DOGS. W.H. Adams, A.K. LeBlanc, J.C. Phillips. University of Tennessee, Knoxville TN, 37996

Introduction/Purpose: Advanced head and neck cancer in dogs that is not amenable to surgery as a primary treatment is frequently associated with short duration control and survival. In people with advanced head and neck cancer, induction or adjuvant chemotherapy has not been shown to have a definitive benefit when used alone, but has been shown to have a significant survival benefit when used in conjunction with radiation therapy. This study was undertaken to investigate the toxicity and efficacy of combined coarse fraction radiation therapy and chemotherapy in advanced head and neck neoplasia in dogs.

Methods: Dogs with advanced head and neck neoplasia that were not considered viable candidates for surgery were entered. Treatment protocol consisted of 4 once weekly 8 Gy fractions to minimum tumor dose of 32 Gy. Carboplatin was administered approximately 30 minutes prior to irradiation on radiation treatment days 1 and 4. Two additional carboplatin doses were scheduled at 3 weeks and 6 weeks following the last irradiation. Local tissue toxicity was assessed using the VRTOG classification and systemic toxicity was evaluated using clinicopathologic testing.

Results: Nine dogs have entered the protocol to date. Tumors treated were maxillary squamous cell carcinoma (6), nasal nonkeratinizing squamous cell carcinoma (1), and nasal chondrosarcoma (2). All dogs completed the radiation therapy component of the protocol. Initial doses of carboplatin ranged from 200 – 300 mg/m². One dog was euthanized due to severe myelosuppression and neurologic signs following fourth radiation/second chemotherapy treatment. Three dogs experienced delays in chemotherapy treatment related to myelosuppression. One of these dogs also had delays in both radiotherapy and chemotherapy related to treatment induced acute renal failure, most likely related to combined anesthesia induced hypotension and carboplatin toxicity. Five of the 9 dogs received all 4 doses of intravenous carboplatin with 2 dogs having reduced dose on latter treatments. Two dogs received intralesional carboplatin in place of last intravenous treatment. Gemcitabine was substituted for carboplatin for subsequent treatments in the dog experiencing acute renal failure. Significant acute local tissue toxicity consisted of grade 3 (1 dog) and grade 2 (2 dogs) ophthalmic complications and grade 3 mucositis in the dog experiencing acute renal failure. Significant late local toxicity was limited to dogs listed above with grade 3 (1 dog) and grade 2 (2 dogs) ophthalmic complications. Tumor responses consisted of CR (4 dogs), PR (3 dogs) and NR (2 dogs). The two dogs without response were the animal with nonkeratinizing squamous cell carcinoma and the animal dying during the course of treatment. Three dogs have had recurrence or progression of disease, two of which have been euthanized. Five dogs remain alive and in remission.

Discussion/Conclusions: Coarse fraction chemoradiation appears to have benefit in reducing and controlling tumor mass in some dogs with advanced head and neck cancer and warrants further study. Significant local and systemic toxicity are potential sequelae.

RELATIONSHIP OF CLINICAL STAGE AND TUMOR HISTOLOGY TO RECURRENCE OF CANINE NASAL NEOPLASIA FOLLOWING RADIOTHERAPY

WM Adams, M Kleiter, DE Thrall, T La Due, J Klauer, LJ Forrest, N Keuler. University of Wisconsin-Madison, 53706

Introduction: Canine intranasal neoplasia (INN) historically has been difficult to control. Recent reports suggest improved survival with accelerated radiotherapy, pre-operative accelerated radiotherapy or chemoradiotherapy, so refinement in prognostic factors may be useful. This study evaluated the prognostic usefulness of computed tomography(CT)-derived INN clinical staging, alone or in conjunction with tumor histopathologic classification, applied to dogs that received radiotherapy for INN.

Methods: Medical records of INN-affected dogs that completed a cobalt teletherapy protocol at three institutions were retrospectively reviewed. Dogs that received chemotherapy, immunotherapy or surgical exenteration of their INN were not included. Minimum follow up was until death or 18 months after start of RT. Nasal CTs were assessed using 4 staging systems. Event-free (EFS) and overall survival (OS) were compared to CT staging and biopsy results. Tumor types were divided into 3 categories: undifferentiated / anaplastic or squamous cell carcinoma; all other carcinomas; all sarcomas.

Results: Eighty-seven dogs met inclusion criteria. UW cases received 42 Gy in 10 fractions over 11 days; NCSU and FLVS cases received 51 - 57 Gy in 17 - 19 fractions over 22 - 24 days. No significant relationship was found between age and histologic tumor type, survival times or clinical stage. Median EFS and OS for all dogs was 6.0 and 13.0 months, respectively. Cause of death was related to INN for 79% of dogs. Eighteen dogs (21%) were alive at time of writing (surviving 18.8 – 74.2 mo). Two CT staging systems were predictive of EFS and OS. Histopathology was predictive of EFS but was not predictive of OS. Undifferentiated / anaplastic / squamous cell carcinomas cases had shorter EFS.

Conclusion: CT- based clinical staging appears prognostically useful for canine intranasal neoplasia. Combining histopathology and clinical staging resulted in improved significance for both event-free and overall survival.

Proposed Staging Method

T-Stage	CT Description
T-1	Confined to <i>one nasal passage</i> , paranasal sinus or frontal sinus, with no bony involvement beyond the turbinates
T-2	<i>Any bony involvement</i> beyond the turbinates, but with no evidence of retrobulbar, subcutaneous, or submucosal mass
T-3	Extension causing a <i>subcutaneous</i> mass, OR <i>submucosal</i> mass OR Involvement of <i>retrobulbar</i> region OR the <i>nasopharynx</i>
T-4	Extension causing lysis of, OR through the <i>cribriform plate</i>

RETROSPECTIVE EVALUATION OF LATE COMPLICATIONS IN 36 PATIENTS UNDERGOING DEFINITIVE RADIATION OF THE PELVIS. J.J. Arthur, M. Kleiter, D.E. Thrall, A. F. Pruitt. College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606

Introduction/Purpose: Although radiation of the pelvic canal is fairly common, there are no large studies evaluating late complications following definitive therapy. The purpose of this retrospective study was to determine the prevalence of late complications, and to classify them by type, time to occurrence and outcome.

Materials and Methods: Criteria for inclusion were: canine patients receiving definitive radiation therapy (≥ 45 Gy) to the pelvis or pelvic canal, to include at least a portion of the colon, with at least six month survival and follow-up based on re-examination or personal communication with the owner or referring veterinarian. Between 1987 and 2005, 36 patients were found to meet these criteria. The following factors were assessed: patient demographics, tumor type/location, radiation prescription, field size, adjunctive therapy (surgery, chemotherapy and/or hyperthermia), presence/absence of late complications and timing until event, survival time and cause of death.

Results: The majority of tumors were anal sac adenocarcinomas (n=14) followed by carcinomas and soft tissue sarcomas (4 each), mast cell tumors and fibrosarcomas (3 each), perianal adenomas and hemangiosarcomas (2 each), infiltrative lipomas, basal cell carcinomas, transitional cell carcinomas and leiomyosarcomas (1 each). Total radiation dose was either 45 Gy (n=2), 48 Gy (n=16), 56.25 Gy (n=2) or 57 Gy (n=16). Fraction size was either 2.25 Gy (n=2) or 3 Gy (n=34). Adjunctive treatment consisted of surgery (n=13), surgery and chemotherapy (n=10), chemotherapy (n=4), or a combination of hyperthermia and surgery (n=1), hyperthermia and chemotherapy (n=1), hyperthermia and both (n=1). Late complications requiring medical or surgical management occurred in 12/36 patients (33%). The most frequent complications were draining tracts or necrotic, non-healing areas in the radiation field (n=4, 11.1%), colitis (n=3, 8.3%) and stricture (one each urethral and vaginal) (n=2, 5.6%). There was one occurrence each of the following: pelvic osteopenia, iliosacral osteosarcoma, and rectal perforation. Two patients were euthanized as a direct result of their late complications (iliosacral osteosarcoma, rectal perforation) (n=2, 5.6%).

Conclusion: We found that definitive irradiation of the pelvis results in serious late complications in approximately 1/3 of patients. Although the majority of these late complications could be managed medically or surgically, they were time and labor intensive and affected the patient's quality of life. Considering the relatively high overall late complication rate, consideration should be given to use of lower fractional doses for pelvic irradiation.

PHOTODYNAMIC THERAPY (PDT) FOR THE TREATMENT OF FELINE CUTANEOUS SQUAMOUS CELL CARCINOMA. J. Buchholz, C. Rohrer Bley, S. Ohlerth, M. Wergin, B. Kaser-Hotz, Section of Diagnostic Imaging and Radiation Oncology, Vetsuisse Faculty, University of Zurich, Switzerland, CH-8057.

Introduction/Purpose: In veterinary medicine, PDT is a rather new treatment modality for cancer. Once the equipment is available, the treatment is easy to perform and often a single session is sufficient for local tumor control. The principle of PDT is based on the interactions between a photosensitizer, light and oxygen. These three components photochemically eradicate malignant tissue. The goal of this study was to investigate photodynamic therapy (PDT) in cats with cutaneous/mucocutaneous squamous cell carcinoma.

Methods: Twenty-one cats with 24 lesions received *m*-THPC, an intravenously administered photosensitizer. A conventional lipophilic formulation of *m*-THPC (n=6) and a new liposomal formulation (n=18) was used. After maximal intratumoral accumulation of the photosensitizer the tumor was illuminated with laser light in the anesthetized animal. Before, 5 minutes, one hour, and 24 hours after light treatment power Doppler ultrasound was performed to investigate the vascular effects of PDT in tumors (n=7). Images were digitized for assessment of vascularity and blood volume. Blood parameters were analyzed serially in all cats and VEGF levels were determined prior to PDT (n=18). Patients were observed for side effects during and after therapy.

Results: All cats responded to therapy. Of the 24 treated lesions, 10 (42%) recurred with a median time to recurrence of 546 days. Local control could be achieved in 59% of patients at one year post therapy. Eighty-three percent of the tumors treated with the lipophilic formulation and 28% of the tumors treated with the liposomal formulation showed tumor recurrence. On power Doppler ultrasonography, a significant decrease in vascularity and blood volume was noted after PDT; lowest values were found 24 hours after PDT. No blood parameter changes were detectable. Stage, tumor location, pre-PDT VEGF levels and presence of side effects could not be established as prognostic indicators. Acute side effects included local edema and erythema and were seen in 8 of the 24 cats (33%).

Discussion/Conclusions: PDT represents an easy and effective treatment modality for feline cutaneous squamous cell carcinoma. The cosmetic outcome is favorable and side effects are acceptable. In a previous study we could show a 4 times higher and a much earlier maximal drug accumulation in the tumor for the liposomal formulation. This results in a much more selective treatment of the tumor. Furthermore the treatment can be accomplished within 6 hours compared to 48 hours with the conventional formulation. The distinct effect on tumor vessels shown by Doppler ultrasound indicates the importance of the vascular component in tumor destruction with *m*-THPC-PDT. In a future study we plan to combine PDT with radiation therapy as a new treatment modality for feline oral squamous cell carcinoma.

TREATMENT OF CANINE BLADDER CANCER USING MINIMALLY INVASIVE INTRAOPERATIVE RADIOTHERAPY (MIR) L.J. Forrest¹, S.M. Murphy¹, A.N. Gutiérrez¹, D.E. Bjorling¹, T.R. Mackie^{1, 2} ¹University of Wisconsin, Madison, WI, ²TomoTherapy, Inc., Madison, WI

Introduction/Purpose: Organ motion and adjacent critical normal tissues hinder curative treatment of intra-abdominal tumors with external beam radiotherapy. Intraoperative radiotherapy has been used to isolate abdominal tumors and avoid critical normal tissues. However this invasive therapy only permits a single fraction of radiation. A minimally invasive surgical technique to place separators between tumors and adjacent normal tissues that would remain in the patient during fractionated radiotherapy allows both target organ isolation and avoidance of critical normal tissues. Helical tomotherapy is image-guided intensity modulated radiotherapy, where a CT scan of the patient in the treatment position can be obtained each day prior to therapy. The combination of organ isolation and daily image-guided radiotherapy allows delivery of dose without geometric uncertainties and conformal avoidance of critical normal tissues. The purpose of this study is to show dose reduction on critical structures in the treatment of canine bladder cancer, transitional cell carcinoma (TCC), using minimally invasive intraoperative radiotherapy (MIR). MIR geometrically displaces the PTV through use of a surgically placed, custom tissue expander (TE). Spontaneous canine bladder cancer is similar in biological behavior to muscle invasive human bladder cancer.

Methods: A dog with confirmed and fully staged TCC of the urinary bladder underwent biopsy via cystoscopy. An inflatable separator device (TE) was placed between the urinary bladder and colon, sutured to adjacent ligaments. The TE was inflated prior to the planning CT scan and at each treatment to the same volume. The dog underwent fractionated radiotherapy using helical tomotherapy (2.5 Gy x 18 = 45 Gy). An MV CT was done prior to each treatment and aligned with the planning kV CT to ensure accurate organ positioning and avoidance of colon and small intestines. A kV CT was performed at the end of therapy. The TE was removed two weeks after completion of therapy. Colonoscopy and cystoscopy were performed prior to and 2 weeks after completion of therapy.

Results: The dog tolerated the TE and radiotherapy. However, the TE became detached, requiring an additional surgery for reattachment. On the kV CT at the completion of therapy, majority of the inflated TE was cranially located as compared to the original CT. The dog did not show signs of colitis; the colon appeared the same both pre- and post therapy. The tumor size decreased after radiotherapy. Two months post therapy, the dog is continent, not straining to urinate and has no hematuria.

Conclusions: Use of MIR is feasible in the treatment of spontaneous TCC of the canine bladder. Despite lack of TE position reproducibility, there were no acute radiotherapy side effects. This clinical model will be used to develop software for quick radiotherapy treatments on-the-fly. A planning MV CT is performed, generic shape contours used to define regions of interest and manipulated in 3-D space, a treatment prescription is applied, a quick optimization is performed, treatment plan is constructed, and the treatment is delivered all under the same anesthetic event.

PREOPERATIVE VERSUS POSTOPERATIVE 3D RADIATION TREATMENT PLANNING FOR SOFT TISSUE TUMORS. M.C. McEntee, A.P. Pease, H.N. Erb, N.L. Dykes. College of Veterinary Medicine, Cornell University, Ithaca, New York, 14853

Introduction/Purpose: The purpose of this study was to compare computed tomography (CT)-based, computer-generated, three-dimensional (3D) radiation treatment planning pre- versus postoperatively for soft tissue tumors. Based on previous reports postoperative radiation treatment fields are significantly larger than preoperative treatment fields based on treatment planning with a margin around a tumor preoperatively and around a surgical scar postoperatively. Defining postoperative radiation treatment fields using CT images and 3D radiation treatment planning should more accurately define the field size and potentially allow reduction in the volume of irradiated tissue in the postoperative setting.

Methods: Dogs and cats that presented to the Cornell University Hospital for Animals (CUHA) for a soft tissue mass were eligible for inclusion. All patients had a preoperative CT scan (3mm slices, pre- and post-contrast images), definitive surgical resection of a tumor, and a postoperative CT scan. A subset of patients had postoperative radiation therapy. CT images were down-loaded to a 3D radiation treatment planning computer and treatment planning was done using the pre- and post-contrast images for both pre- and postoperative scans. The tumor volume preoperatively defined by CT was compared to the surgical volume identified on the postoperative CT images. The area of the treatment fields at the source axis distance (SAD) was compared between the pre- and postoperative radiation treatment fields.

Results: 13 dogs and 4 cats that presented to CUHA between October 2002 and December 2005 were entered into the study. Tumor histopathologic types included hemangiopericytoma (4), other soft tissue sarcomas (7), benign soft tissue tumor (2), mast cell tumor (2) and thyroid carcinoma (2). 12 of the patients were irradiated postoperatively. The mean preoperative field area was $110 \text{ cm}^2 \pm \text{SEM}15$ (range = 31.3-257.3 cm^2), compared to a mean postoperative field area of $140 \text{ cm}^2 \pm \text{SEM} 18$ (range = 36.8-279.9 cm^2) ($p = 0.1264$). The field area for postoperative treatment fields was larger than the preoperative field in 13/17 (76%), and smaller in 4/17 (24%). The mean preoperative tumor volume was $116.1 \text{ cm}^3 \pm \text{SEM} 38.2$, compared to a mean postoperative surgical volume of $59.4 \text{ cm}^3 \pm \text{SEM} 10.2$ ($p = 0.1611$). The postoperative surgical field volume was larger than the preoperative tumor volume in 7/17 patients.

Discussion/Conclusions: Previous reports have documented a significant increase in radiation treatment field in the postoperative versus preoperative treatment setting when radiation treatment fields were setup based on a margin around a surgical scar. The current study based on CT imaging did not result in a similar finding in all patients. There was not a statistically significant difference in field area comparing the preoperative to the postoperative field area ($p = 0.12$).

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RETROSPECTIVE REVIEW OF 50 CANINE NASAL TUMOURS EVALUATED BY LOW FIELD MAGNETIC RESONANCE IMAGING A. Avner, J.I. Sales and M.E. Herrtage
University of Cambridge, CB3 0ES, UK

Introduction/Purpose: While CT is a valuable imaging technique for identifying bone destruction and soft tissue involvement, MRI has the advantage of excellent tissue contrast, multiplanar imaging capacity and lacks ionizing radiation and bone beam-hardening artifact. MRI is superior to CT for evaluating the extent of nasal tumours and for demonstrating involvement of the brain and paranasal structures. Currently, there are no reported studies detailing the MR features of canine nasal tumours. The aim of this study was to describe and characterize the MR features of canine nasal tumours.

Materials and Methods: The Queen's Veterinary School Hospital MRI database (2001-2005) was searched for dogs with an MRI diagnosis of a nasal tumour. Fifty-eight cases were found of which 50 cases had a confirmed histological diagnosis of nasal tumour. MRI was performed in each dog under general anaesthesia using a dedicated veterinary MRI unit (Vet-MR, Esaote) incorporating an open 0.2 Tesla permanent magnet. The head was placed in a dual phased array coil (143mm x 158mm). T1-weighted, T2-weighted and proton density weighted images of the nasal chambers and paranasal sinuses were acquired in the dorsal, transverse and sagittal planes. T1-weighted images were also acquired following intravenous administration of 0.1 mmol/kg gadobenate dimeglumine (MultiHance, Bracco). All scans were reviewed individually by one of the authors (AA). The appearance and spread of the nasal tumour as well as the involvement of adjacent anatomic structures were examined against a checklist.

Results: Only 86% (50/58) of the cases initially selected were confirmed histologically as nasal tumours. In 4 cases (4/50=8%) the histological confirmation was only made after 2nd or 3rd biopsy attempt. Thirty six tumours (72%) were of epithelial origin (carcinomas) and eleven (22%) were of connective tissue origin (sarcomas). Regional lymph node metastasis was detected in 4 cases (8%) whereas none of the cases had evidence of pulmonary metastasis on thoracic radiographs. The nasal lesions were mass-like in 98% of cases. The lesions were most commonly unilateral and extensive (21/50=42%). Mass lesions affecting the middle and caudal nasal cavity were seen in 14 cases (28%). Cribriform plate destruction was evident in 6 dogs (12%). The nasal septum was eroded in 68% of cases. Mass lesions in maxillary recess were evident in 72% of cases. Mass lesions extending into the sphenopalatine sinus were evident in 66% of cases. Nasal/frontal bone destruction was noted in 26 dogs (52%). In 20 dogs (40%) the tumour extended into the nasopharynx caudally to the level of the eyes. In 20 dogs (40%) the tumour was apparent in the frontal sinuses, while trapped secretions or mass/secretions combinations were detected in 62% of cases. Only in 8 cases (16%) there was noticeable tumour extension into the calvarium, however 54% of cases showed focal meningeal hyperintensity. A Chi squared test showed that carcinomas were statistically more likely to be isointense on T1W images and hyperintense on T2W images ($p < 0.001$) while sarcomas were statistically more likely to be hyperintense on T1W and iso/hypointense on T2W images ($p < 0.001$). T1W sequences post- gadolinium produced enhancement of the tumour in all cases.

Conclusion: We believe that MRI allows accurate diagnosis of nasal tumours and their extent and should be the primary mode of investigation and treatment planning.

ASSESSMENT OF NOVEL TREATMENT EFFICACY FOR CANINE SPONTANEOUS TUMORS WITH DYNAMIC CONTRAST ENHANCED MRI. S. Kraft, D. Thamm, D. Vail, N. Ehrhart, S. LaRue. College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523.

Introduction/Purpose: Dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) of malignant tumors is used to assess the delivery, wash-in and washout of intravascular small molecular weight contrast media. Tumor areas with the most rapid rate of uptake have been proposed to correspond to higher histologic grade and increased angiogenesis and/or perfusion. Alterations in the pharmacokinetics of tumor DCE-MRI after treatment may help identify positive responders to neoadjuvant therapy. We are evaluating the usefulness of DCE-MRI for assessing the efficacy and treatment tolerance to novel therapies being used on canine spontaneous tumors.

Methods: Dogs with various spontaneous malignant tumors have undergone DCE-MRI prior to, and serially up to a week after treatment, as part of their standard evaluation during Phase I/II oncology trials at CSU. After routine anatomic T1-weighted and STIR imaging of the tumor, DCE-MRI is done by injecting gadolinium-DTPA I.V. (0.1 mmol/kg) with a power injector (2 - 3 ml/sec) and repeatedly scanning a selected tumor slice or entire tumor volume using 3D SPGR T1-weighted scans. Temporal resolution is 10 – 30 sec per phase for a total period of 8-10 minutes. Time-signal intensity curves are derived from regions-of-interest drawn of the tumor. “Intensity based” two compartment modeling is performed to derive biomarkers such as transfer rate constant (k^{trans}), instantaneous area under the curve (IAUC), and volume of the extracellular space (V_e) (Perfusion Analyzer, VirtualScopies Inc, Rochester NY). Tumor volumes are measured using segmentation-based 3D software (Voxar 3D, Barco, Belgium).

Results: Examples of DCE-MRI results will be presented in the context of other tumor factors such as % tumor necrosis and microvascular density, to illustrate its potential usefulness in evaluating treatment effects. This will include results showing a correlation of % area of contrast enhancement with measured % osteosarcoma tumor necrosis (n=7), temporal alterations in k^{trans} after pegylated tumor necrosis factor administration that relate to vascular permeability changes and inflammation (n=4), and decreased dynamic contrast enhancement immediately after tumor irradiation (n=9).

Discussion/Conclusions: DCE-MRI methodology has evolved over the last 10 years, and its clinical relevancy to cancer therapy holds great interest. In our clinical trials, DCE-MRI provides insight into alterations in tumor vascular permeability x flow that can then be related to the biological effects of novel therapeutics.

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DYNAMIC CONTRAST ENHANCED COMPUTED TOMOGRAPHY OF NORMAL BRAIN AND INTRACRANIAL MASS LESIONS IN DOGS. A.G. MacLeod, P.J.

Dickinson, R.A. LeCouteur, R.E. Pollard. University of California, Davis School of Veterinary Medicine Davis, CA, 95616.

Introduction/Purpose: Due to the clinical importance of cerebral mass lesions and the sensitivity of brain tissue to surgical or image-guided biopsy, investigation of non-invasive diagnostic techniques is of increasing clinical interest for the characterization of lesion origin and type. A variety of imaging techniques have been developed in experimental animals and human patients to assess hemodynamic parameters by dynamic contrast-enhanced computed tomography (DCCT) imaging. Dynamic functional studies quantify the changes in blood flow and volume in sites of pathology due to changes in vascularity. In this pilot study, functional vascular parameters were measured in clinically normal canine brain tissue using DCCT and compared to values obtained from intracranial mass lesions in 2 dogs.

Methods: DCCT examinations were performed on 5 patients presenting for signs referable to pituitary-dependent hyperadrenocorticism. These animals had no other clinical signs or CT lesions suggestive of intracranial disease and were used to calculate normal values in brain distant from the pituitary gland. In addition, DCCT was performed on 2 clinical patients with intracranial masses. DCCT consisted of serial, stationary images acquired during automated bolus injection of a standard CT contrast agent. Once dynamic CT data was acquired, CT-guided stereotactic biopsies of the mass lesions were performed in the 2 clinical patients and submitted for histopathologic analysis. CT data post-processing was performed on a workstation equipped with commercially available CT software (GEMS Advantage Workstation 4.2). Symmetric regions of interest (ROI's) were drawn around abnormal and contralateral regions in the clinical group and around frontal (including equal volumes of both grey and white matter) and thalamic regions in the control group. Contrast enhancement curves, parametric maps and mean regional values of blood flow (BF), blood volume (BV), mean transit time (MTT) and permeability (PS) were obtained. Values were compared between control and clinical groups and within clinical patients with unilateral disease.

Results: There was no significant difference between values in the frontal and thalamic brain regions in the control group. Mean control group values were BF=41.7+/-6.6 ml/min/gram of tissue, BV=2.61+/-0.37 ml/min, MTT=5.3+/-0.84 sec and PS=1.7+/-1.14 ml/min/gram of tissue. Parametric maps indicated multifocal cerebrovascular abnormalities in the case of necrotizing encephalitis and a focal abnormality in the imaging plane obtained from the patient with fungal encephalitis. In the patient with necrotizing encephalitis, BF=194.2 ml/min/gram of tissue, BV=9.42 ml/min, MTT=3.9 sec and PS=12.76 ml/min/gram of tissue. In the patient with fungal encephalitis, BF=38.4 ml/min/gram of tissue, BV=4.2 ml/min, MTT=9.0 sec, PS=5.25 ml/min/gram of tissue. Lesion permeability was markedly increased when compared to the contralateral ROI in the clinical patients and to the control group average.

Discussion: DCCT is capable of estimating quantitative values for cerebral BF, BV, MTT and PS in normal and diseased tissue. The changes recorded by DCCT imaging are thought to represent the neovascularization and increased vascular permeability associated with inflammation. Further use of this technique may provide important diagnostic and prognostic indicators for cerebral mass lesions.

CROSS-SECTIONAL IMAGING CHARACTERISTICS OF PITUITARY ADENOMAS AND ADENOCARCINOMAS IN DOGS: 24 CASES. M.R. Uerling, R.E. Pollard, F.D. Wood, E.C. Feldman. University of California Davis, California, 95616.

Introduction/Purpose: Pituitary-dependent hyperadrenocorticism (PDH) accounts for 85-90% of naturally occurring hyperadrenocorticism in dogs. While <5% of canine pituitary tumors exceed 10 mm in greatest diameter at the time of diagnosis, 20 - 30% of dogs with PDH eventually develop large (>10 mm) pituitary masses. In humans, pituitary adenocarcinomas carry a worse prognosis than adenomas, though this has not yet been established in dogs. CT or MRI is used to diagnose pituitary tumors in both human and veterinary medicine. The purpose of this study was to compare the cross-sectional imaging findings in dogs with pituitary adenomas and dogs with pituitary adenocarcinomas to determine if imaging differences can distinguish between them.

Methods: UC Davis VMTH records were reviewed from 1989-2006 and dogs were selected retrospectively for inclusion if either CT or MRI with contrast imaging of the brain was performed and definitive histologic diagnosis of either pituitary adenoma or adenocarcinoma was made. Cross-sectional images for these dogs were evaluated for presence of a mass, mass shape (round, oval, or irregular), maximal dorsal to ventral height of the mass, presence and character of contrast-enhancement, and evidence of surrounding brain tissue compression. Survival times were calculated between the initial diagnosis of disease and post-mortem. Subjective imaging results were compared for those dogs being diagnosed with pituitary adenoma and adenocarcinoma. Mean mass size for both groups was statistically compared using a Student's t-test.

Results: 15 dogs with pituitary adenoma and 9 dogs with pituitary adenocarcinoma were eligible for inclusion. 13/15 (87%) of the dogs with pituitary adenoma had a mass on cross-sectional imaging. Of those, 12/13 (92%) were contrast-enhancing with 9/12 (75%) being uniformly contrast-enhancing. Mean mass height was 1.25 ± 0.5 cm. Mass shape and surrounding brain compression was variable. Dogs with pituitary adenoma survived a mean of 14.3 months (median 8). All dogs with pituitary adenocarcinoma had a contrast-enhancing mass. 6/9 (67%) of these masses were uniformly contrast-enhancing. Mass shape varied and mean height was 1.98 ± 0.6 cm. 7/9 (78%) showed evidence of surrounding brain compression. Dogs with pituitary adenocarcinoma survived a mean of 2.9 months (median 0.5). Adenocarcinomas were significantly larger ($p=0.007$) than pituitary adenomas.

Discussion/Conclusions: Canine pituitary masses that are tall and compressive are suggestive of but not definitively adenocarcinomas. Additional imaging characteristics between the two groups of dogs could not differentiate tumor type. Results suggest that dogs with pituitary adenocarcinomas might have a poorer prognosis. However, the treatment of dogs in this study varied widely. Additional studies involving larger numbers of dogs are required to establish more significant guidelines for imaging differentiation and prognostication of these tumors.

GENERALIZED CEREBRAL ATROPHY SEEN ON MRI IN ASYMPTOMATIC AND SYMPTOMATIC SCRAPIE INFECTED SHEEP FROM A NATURALLY EXPOSED FLOCK. A.L. McKnight¹, L.A. Minkoff², J.M. Stutman², B.V. Thompsen³, P.L. Habecker¹, R.W. Sweeney¹, G. Smith¹, and D.L. Sutton⁴ ¹University of Pennsylvania, New Bolton Center, Pennsylvania, 19348; ²Bovonics, Inc. New York, 11560; ³USDA, National Veterinary Services Laboratory, Iowa 50010; ⁴USDA, APHIS, Veterinary Services, Maryland, 20737

Introduction: Magnetic resonance imaging (MRI) has been helpful in the diagnosis of prion diseases such as sCJD and vCJD (sporadic and variant Creutzfeldt-Jakob Disease, respectively), but patients are scanned only when clinical symptoms appear, often at the late stage of disease. MRI abnormalities have been described in asymptomatic mice and hamsters following experimentally induced scrapie; but, in these models, the course of disease is very different from natural infection. We evaluated the MRI findings in a flock of 111 naturally exposed scrapie sheep in various stages of disease progression.

Methods: All sheep were of the scrapie-sensitive QQ₁₇₁ genotype, varied in age from 1-9 years old, and represented white faced, black faced, and brockel faced breeds. T1W, T2W-FSE, proton density, inversion recovery, FLAIR, and diffusion-weighted (DWI) pulse sequences were acquired at 1.5T under general anesthesia (24 scrapie exposed sheep and 6 control sheep) or immediately following euthanasia (87 scrapie exposed sheep).

Results: Our MRI findings revealed no clear, consistent hyperintense or hypointense signal changes in the brain on either clinically affected or asymptomatic positive animals on any sequence. However, in all 37 scrapie positive sheep (28 asymptomatic and 9 clinical animals), there was a greater ventricle to cerebrum area ratio on MRI compared to 74 PrP^{Sc} negative sheep and 6 control sheep as confirmed by immunohistochemistry (IHC). No correlation between the ventricle to cerebrum area ratios and age was present, but a trend toward greater ratios in clinically affected animals in advanced disease was seen. Nine of these 37 positive sheep, including 2 one-year old animals, were PrP^{Sc} positive in the extraneural lymphoid tissue but PrP^{Sc} negative in the brain (obex). Twelve percent (9/76) of the third eyelid tested sheep were false negatives and also had enlarged ventricle to cerebrum ratios.

Conclusions: Our findings indicate diffuse cerebral atrophy in young and older scrapie infected sheep, prior to the onset of clinical signs that we believe is related to the progression of disease. The results of this study, particularly the nine positive sheep that were PrP^{Sc} negative in the obex, suggest that immunohistochemistry is not sensitive enough for detecting low levels of PrP^{Sc} and/or that diffuse neuronal loss/brain atrophy in this scrapie flock is not directly related to the accumulation of PrP^{Sc} in the brain.

CONTRAST ULTRASOUND ASSESSMENT OF ANGIOGENESIS IN A MATRIGEL MODEL IN RATS. S. M. Stieger¹, S. H. Bloch², O. Foreman³, E. R. Wisner¹ and P. A. Dayton²
Department of Surgical and Radiological Sciences¹, School of Veterinary Medicine, Department of Biomedical Engineering² and Comparative Pathology Laboratory³, University of California, Davis, CA 95616, USA

Introduction: Angiogenesis, a process in which capillaries develop from a preexisting vascular network, is of critical importance in many physiological and pathological processes. Particularly in the development of cancer as well as the progression and recurrence of tumors, angiogenesis has been shown to be a valuable prognostic factor. Currently non invasive techniques evaluating angiogenesis in a clinical setting are rare or lacking. In this study we present the results of an initial study of the use of contrast ultrasound for the assessment of angiogenesis in Matrigel plugs in a rat model.

Method: Matrigel plugs with and without basic fibroblast growth factor (+bFGF/-bFGF) were implanted into the left and right caudo-ventral regions of 11 male, albino Sprague-Dawley rats. Ultrasound imaging of each plug before and after injection of ultrasound contrast agent was performed 7 and 14 days after implantation. The rats were euthanized following the final imaging session and the plugs removed for histological analysis.

Results: Statistically significant differences between Matrigel plugs with and without bFGF were apparent at day 7 in both plug size and contrast enhancement (both $p < 0.05$). At day 14, these differences were less pronounced. Histopathology revealed similar differences in microvessel density between +bFGF and -bFGF plugs at day 7 and 14. There was a significant correlation between microvessel density and both contrast-enhanced area ($r = 0.47$, $p < 0.05$) and percent of plug enhanced ($r = 0.59$, $p < 0.05$).

Conclusion: Contrast-assisted ultrasound assessment of angiogenesis in a Matrigel plug model in rats has shown to be a robust method for distinguishing between plugs in two different angiogenic states. Ultrasound measurements of blood flow in the plugs 7 and 14 days post-implantation correlated with microvessel density, a widely used histological technique to measure tumor angiogenesis.

A COMPARISON OF IOPAMIDOL WITH IOPROMIDE AND IOHEXOL CONTRAST MEDIA IN HEPATIC CT ANGIOGRAPHY IN BEAGLE DOGS. YC Jeong, CY Lim, GM Kim, SO Lee, JH Jung, JH Chang, SK Oh, KJ Song, HJ Park*, Yoon and MC Choi College of Veterinary Medicine, Seoul National University, Seoul, Korea, *Department of Veterinary Medicine, Cheju National University, Jeju, Korea

PURPOSE: The purpose of this paper was to compare the clinical efficacy of iopamidol and iopromide, iohexol non-ionic contrast media in terms of their image quality in Beagle dogs with hepatic CT angiography and their application in veterinary clinics.

METHODS: With 9 Beagle dogs, contrast media of iopamidol (pamiray-300[®]) and iopromide (ultravist-300[®]), iohexol (omnipaque-300[®]) were induced intravenously (600 mg I/kg, BW) and CT angiography was done under general anesthesia. CT scan included scout, pre-contrast and cine examinations. During CT angiography, peak HU (Hounsfield unit) and peak time were examined on each site (ROI ; region of interest) of the aorta, caudal vena cava, portal vein and liver parenchyma. Any side effects were also examined.

RESULTS: After experiments, it was found that there were no significant changes of HU and maximal enhancing time of each ROIs of aorta, caudal vena cava, portal vein and liver parenchyma between these contrast media. And any side effects were not noted.

CONCLUSIONS: It is concluded that iopamidol has similar contrast enhancement like as iopromide and iohexol in hepatic angiography and it is thought to be useful for evaluation of the abdominal organs by CT scan in veterinary clinics.

MULTIDETECTOR CT ANGIOGRAPHY IN ACQUIRED ANOMALIES OF THE CANINE PORTAL VENOUS SYSTEM DUE TO PORTAL HYPERTENSION: THREE CASES. G. Bertolini, DVM, A. Zotti, DVM, PhD, M. Caldin, DVM, Dipl. ECVCP

Introduction: Portal hypertension results when normal blood-flow from abdominal splanchnic vessels to the right heart is impeded. Increased portal venous pressure in dogs may result in a portal system flow reversal, changing from hepatopetal (towards the liver) to hepatofugal (away from the liver). Arteriportal communications and multiple acquired extrahepatic shunts are thought to be due to blood-flow reversal. In humans, among the various collateral pathways that could origin as a result of portal hypertension, esophageal varices are the most clinically important because these are frequent sources of severe gastrointestinal bleeding. To the best of the author's knowledge neither clinical evidences nor imaging findings of spontaneous varices in dogs with portal hypertension have been previously described. Our aim is to discuss the multidetector computed tomography (MDCT) angiographic findings in 3 dogs with acquired multiple porto-systemic shunts and esophageal varices.

Materials and Methods: Three dogs were included in this work: non-neutered females ($n=2$) and non-castrated male ($n=1$). The represented breeds were: German Shepherd Dog ($n=2$) and Cocker Spaniel ($n=1$); the mean age \pm SD was 4.6 ± 3.7 year and the mean \pm SD body weight was 17.6 ± 7.2 kg. Clinical signs were: ascites, hepatic failure, and hepatic-encephalopathy. The CT-examinations were performed using an MDCT scanner (Lightspeed 16, *GE Medical Systems, Milwaukee, WI, USA*). A unenhanced series was initially performed, followed by two enhanced series. Each patient was examined in dorsal recumbency on the CT table, under general anesthesia. The scanning parameters were 120 kVp, 180-200 mA, 0.625-1.2 mm slice thickness, pitch of 0.562:1, and 0.5-0.7 sec per rotation. Contrast material (640 mg I/kg IV) (Visipaque® 320, *Amersham Health, Princeton, HJ*) was injected at a rate of 3ml/sec via a power injector (Envision CT Injector System, *Medrad, Indianola, PA*) through a 20-22 gauge catheter on the right/left cephalic vein. A special workstation (ADW® 4.1, *GE Medical Systems, Milwaukee, WI*) was used to generate two-dimensional reformatted images (2D RFMT) and three-dimensional volume rendered (3D VR) models of the portal system collateral vessels.

Results: MDCT imaging studies confirmed hepatofugal portal circulation and gastro-esophageal and/or mesenteric varices in each subject. In one case a portal vein thrombosis was also observed.

Conclusion: MDCT-angiography disclosed complicated acquired portosystemic shunts and varices in dog. Despite our limited study population the described angiographic method could be suggested as a less invasive alternative to conventional imaging methods in assessing hepatofugal collaterals due to portal hypertension.

TRANSPLENIC CT-PORTOGRAPHY USING A MULTI-ROW DETECTOR HELICAL SCANNER: COMPARISON TO CT-ANGIOGRAPHY IN NORMAL DOGS. RL Echandi*, F Morandi*, WT Daniel II[§], JL Paquette*, GB Daniel*. *The University of Tennessee CVM, Knoxville TN 37996, [§] Baptist Regional Medical Center, Corbin, KY 40701.

Introduction: Dual-phase computed tomography angiography (CTA) was developed to image the portal vasculature using a peripheral injection of contrast medium. A transplenic route of injection coupled to CT evaluation has not been reported to this date. The purpose of this study was: 1) to establish a protocol for transplenic CT portography (TSCTP) in normal dogs using a 40-row multi-detector scanner; 2) to compare TSCTP to CTA with respect to image quality; 3) to compare contrast dosages between the two procedures.

Methods: 7 intact, female juvenile dogs weighing 7.0-9.5 kg underwent CTA and TSCTP after initial screening tests (bloodwork, abdominal radiographs, abdominal ultrasound and transplenic portal scintigraphy). CTA was performed with minor modifications of a previously established protocol, using a dose of 814 mg I/kg of Omnipaque administered using a pressure injector. For TSCTP, a 20 or 22 G 1.5 inch needle was placed into the splenic parenchyma using CT guidance. An extension set was attached and Omnipaque (175 mg I/mL) was administered, starting the CT acquisition at the time of the injection. Images were reconstructed at 0.9 mm collimation (CTA) and 1.5 mm collimation (TSCTP). Regions of interest (ROIs) were drawn in the following locations for both studies and the HU values compared: splenic vein close to the spleen, close to the portal vein, and mid-way between the two; main portal vein; right, left and central divisional branches of the portal vein; right, left and central aspects of the hepatic parenchyma. The number of arborizations of the three portal branches and the total contrast medium dose administered were also compared between the two studies. Total contrast dose, pattern of portal vein enhancement and distribution of contrast into the liver were recorded. One Way Analysis of variance and Student's t-test were used with significance set at $P < 0.05$.

Results: The opacification of the splenic vein (in all locations) and that of the main portal vein were significantly higher in TSCTP compared to CTA (median HU in the portal vein: 418.2 for TSCTP vs. 164.4 for CTA). A much higher standard deviation was noted in the HU values of all portal vein ROIs during TSCTP compared to CTA: this was due to significant streamlining of contrast during TSCTP, which was ventrolateral in the majority of cases. This led to the majority of the contrast entering the left divisional branch of the portal vein, which resulted in significantly higher opacification of the left divisional branch during TSCTP compared to CTA. There was no difference in enhancement of the right or central divisional branches between the two studies. There was no difference between the number of visible arborizations from the central and left divisional branches between the two studies; however, fewer arborizations were visible from the right divisional branch during TSCTP (median 2.7) compared to CTA (median 4.0). TSCTP required a significantly lower dose of contrast (median 525 mg I) compared to CTA (median 7,700 mg I). Moderate streak artifacts were noted during TSCP due to edge gradient effect.

Conclusion: TSCTP provided more intense enhancement of the splenic vein and portal vein, with much lower contrast dose, but caused inconsistent intrahepatic portal and parenchymal opacification due to streamlining and presence of streak artifacts. Despite showing significantly lower attenuation of the portal vein, CTA provided sufficient enhancement for vessel identification.

HEPATIC VOLUME ESTIMATION USING COMPUTED TOMOGRAPHY IN DOGS WITH PORTOSYSTEMIC SHUNTS. S.M. Stieger, A. Zwingenberger, R. E. Pollard, A. Kyles, R.F. Larson, E.R. Wisner, From the Department of Surgical and Radiological Sciences, School of Veterinary Medicine, University of California, Davis, Davis, CA 95616, USA

Introduction/Purpose: The estimation of liver volume in people is used to plan partial hepatectomy, measure hepatic regeneration following hepatectomy and to assess liver disease progression. Liver volume may also reflect the functional capacity of the liver. In this retrospective study, we used quantitative computed tomography (CT) to estimate the liver volume of portosystemic shunt patients in comparison to hepatic volume in a control group.

Material and Methods: Thirteen canine patients with portosystemic shunt (PSS) underwent contrast-enhanced abdominal CT for shunt characterization and operative planning. Five dogs without clinical signs relating to liver disease that underwent contrast-enhanced abdominal CT for other reasons were used as a control group. All studies followed established clinical imaging protocols used at our institution. The CT image collimation varied from 2 to 5 mm in portosystemic shunt patients and from 5 to 7mm in the control group. Liver margins were defined on each image using operator-defined regions of interest (ROI) and hepatic volume renderings were produced from which liver volume was quantitatively estimated. Hepatic volume was again calculated following shunt vessel partial ligation in 2 dogs. In 7/13 PSS dogs shunt fraction was calculated from a pre-operative Tc99m transcolonic scintigraphy study and compared to hepatic volume normalized to body weight. To determine the accuracy of volume estimates, phantoms of known volume from water displacement measurements were CT scanned and volumetric estimates calculated using the protocol described above.

Results: The liver volume of both control and PSS dogs correlated well with the body weight. ($r = 0.912$ and 0.910 , respectively, $p < 0.05$). The liver volume normalized to body weight was $16.5 \pm 5.4 \text{ cm}^3/\text{kg}$ in PSS dogs and $25.1 \pm 5.3 \text{ cm}^3/\text{kg}$ in control dogs. The liver volume normalized to body weight was approximately 34% smaller in PSS dogs compared to control dogs ($p < 0.005$). In the 2 PSS dogs in which post-operative partial shunt vessel ligation CT studies were available, 2-4 month post-surgical liver volume increased by 43.8 and 50.6%. In one of these two dogs, a second post-operative CT study performed 22 months following surgery revealed an hepatic volume increase of 76.1%. There was no correlation between shunt fraction and normalized liver volume in the 7 dogs that underwent scintigraphy. Average volume estimation error from phantom studies was less than 10%.

Discussion/Conclusion: Hepatic volume estimation may be a clinically useful parameter in the initial and post-surgical evaluation of dogs with portosystemic shunts.

DYNAMIC CT QUANTITATION OF HEPATIC PERFUSION IN DOGS WITH AND WITHOUT PORTAL VASCULAR ANOMALIES. Zwingenberger, A. L. and Shofer, F. University of Pennsylvania, Philadelphia, PA, 19404

Introduction: Hepatic portal vascular anomalies such as portosystemic shunts and arteriportal fistulae reduce hepatic portal perfusion. Hepatic arterial, pancreatic and small intestinal perfusion as well as hepatic perfusion index have been shown to increase in compensation in dogs. This study was performed to apply CT techniques used in people to compare hepatic, pancreatic and gastric perfusion in normal dogs and those with portal vascular anomalies.

Materials and Methods: This retrospective study includes 10 normal dogs and 21 dogs with portal vascular anomalies. Perfusion values were calculated for the organs included in the dynamic CT.^{1,2} No portal perfusion values were calculated for dogs with arteriportal fistula due to the common occurrence of hepatofugal flow. Results are reported as a mean perfusion with 95% confidence interval.

Results: Gastric perfusion was higher in abnormal dogs (0.72 ml/min/ml, 0.50-0.93, p=0.02) than normal dogs (0.41 ml/min/ml, 0.26-0.56). It was also a mean of 0.57 ml/min/ml higher than normal dogs in the subgroup of dogs with congenital intrahepatic portosystemic shunts (0.10-1.03). Hepatic arterial perfusion was higher in abnormal dogs (0.57 ml/min/ml, 0.44-0.68, p<0.0001) than normal dogs (0.23 ml/min/ml, 0.15-0.32). Congenital intrahepatic portosystemic shunts and arteriportal fistulae had higher hepatic arterial perfusion by 0.39 ml/min/ml (0.10-0.67) and 0.33 ml/min/ml (0.01-0.64) respectively. Hepatic portal perfusion was significantly lower in abnormal dogs (0.52 ml/min/ml, 0.20-0.84, p=0.02) than normal dogs (1.08 ml/min/kg, 0.73-1.43). There were no significant differences in hepatic portal perfusion by subgroup. The hepatic perfusion index was significantly higher in abnormal dogs (0.59, 0.36-0.82, p=0.003) compared to normal dogs (0.19, 0.14-0.24), and congenital intrahepatic portosystemic shunts had a hepatic perfusion index which was a mean of 0.38 higher than normal dogs (0.02-0.74). Total hepatic perfusion and pancreatic perfusion were not different between normal and abnormal dogs.

Conclusions: CT perfusion measurements can be made using dynamic CT in dogs. The significant differences in gastric, hepatic arterial perfusion, hepatic portal perfusion, and hepatic perfusion index may be useful in diagnosing hepatic vascular anomalies and monitoring response to treatment.

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COMPUTED TOMOGRAPHIC FEATURES OF NORMAL PANCREAS AND EXPERIMENTAL ACUTE PANCREATITIS IN DOGS. J.H. Choi¹, C.Y. Lim¹, Y.C. Jeong¹, D.W. Chang², Y.W. Lee³, K.D. Eom⁴, I.C. Park⁵, M.C. Choi¹, J.H. Yoon¹. ¹College of Veterinary Medicine, Seoul National University, Seoul, 151-742, ²College of Veterinary Medicine, Chungbuk National University, Cheongju, 361-763, ³College of Veterinary Medicine, Chungnam National University, Daejeon, 305-764, ⁴College of Veterinary Medicine, Konkuk University, Seoul, 143-701 and ⁵Department of Veterinary Medicine, Kangwon National University, Chuncheon, 200-701, South Korea.

Introduction/Purpose: This study was conducted to evaluate computed tomographic (CT) characteristics for normal pancreas and experimental acute pancreatitis in dogs and to evaluate applicability of the Balthazar computed tomography severity index for dogs.

Methods: The CT examination protocol for canine pancreas was established and the effect of intravenous contrast media on pancreas density and visualization of pancreatic parenchyma was investigated in 22 normal dogs. Changes of CT density of the pancreas and the value of the Balthazar CT severity index in retrograde bile-injected pancreatitis were also investigated in 13 dogs.

Results: Hounsfield unit (HU) value of normal canine pancreas was 52.44 ± 4.58 HU, and the density of the severe acute pancreatitis was significantly lower than that of normal pancreas. The enhancement of normal pancreas was maximized in the portal phase in contrast enhanced CT examination and the pancreatitis-to-pancreas contrast in experimental pancreatitis was maximized in arterial phase. Considering histopathologic results for the extent of pancreatic necrosis as the gold standard, the positive correlation of Balthazar CT severity index was 0.76.

Discussion/Conclusion: The most important factor in canine severe pancreatitis is pancreatic necrosis and it is related to multiple organ dysfunction syndrome and systemic inflammatory response syndrome. On the contrary to human in which infection is the most important predictive factor, the extent of necrosis can be used as predictive index in canine severe acute pancreatitis. The HU value of normal pancreas in this study was similar to that of human. Decreased HU density of pancreatic parenchyma in pancreatitis was due to pancreatic necrosis. Balthazar CT severity index is consisted of degree of pancreatic inflammation, extent of necrosis, and extrapancreatic complications such as ascites. The results of the present study suggest that this scoring system is thought to be applicable to evaluate canine severe acute pancreatitis.

CHARACTERIZATION OF FELINE RENAL VESSEL ANATOMY WITH DUAL-PHASE CT ANGIOGRAPHY A.V. Cáceres, J.L. Bouma, L.R. Aronson, A.L. Zwingenberger.
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Introduction/Purpose: Helical CT renal angiography is used to evaluate the urinary system and the renal vessels of potential feline renal donors.¹ During a series of CT angiograms, variations of renal vessel anatomy from known anatomic standards were observed. The purpose of this study was to describe the feline renal vasculature variation in normal cats.

Materials and Methods: In a retrospective study, 97 feline CT renal angiograms imaged between 1999 and 2005 were reviewed. Transverse, reformatted and 3D reconstructed images of 194 kidneys, aorta and caudal vena cava were examined. The right and left kidneys were evaluated independently for renal parenchyma abnormalities and vessels anatomy. The vessels were characterized as single no bifurcation, single with bifurcation, double or triple.

Results: There were 4/97(4.1%) kidneys which had surface irregularity. The identification of the vessels was best on reformatted images. The right kidney had no triple or double renal arteries, 3/97 (3.1%) single no bifurcation, and 94/97 (96.9%) single with bifurcation. The left kidney had 3/97 (3.1%) arteries with single no bifurcation, 4/97 (4.1%) double and 90/97 (92.8%) single with bifurcation. For the renal veins, the right kidney had 2/97 (2.1%) triple, 14/97 (14.4%) single no bifurcation, 39/97 (40.2%) single with bifurcation, and 42/97 (43.3%) double. The left kidney had no triple veins, 3/97 (3.1%) double, 13/97 (13.4%) single no bifurcation, and 81/97 (83.5%) single with bifurcation. Additionally split caudal vena cava was seen in 2 cases and an accessory renal artery was seen in 2 kidneys entering one renal pole.

Discussion/Conclusions: Multiple renal vessels are often found in cats and may represent the normal vascular anatomy rather than an abnormality. In descending order, the overall vascular pattern was single with bifurcation, double, single no bifurcation and triple. There was variation in the vascular pattern between the right and left kidney. Multiple renal arteries were only present in the left kidney and double veins were more common on the right, similar to previous reports in humans. Identifying and recognizing the pattern of distribution of these vessels is important for the renal transplant surgeon in determining if a cat is an appropriate donor and for the radiologist performing renal related procedures.

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COMPUTED TOMOGRAPHIC FEATURES OF CANINE MASTICATORY MYOSITIS AND OTHER CAUSES OF MASTICATORY PAIN. Tobias Schwarz, University of Wisconsin-Madison, Madison, WI 53706, Alexander M. Reiter, University of Pennsylvania, Philadelphia, PA 19104, USA

Introduction: Dogs can present with difficulties in opening their mouth and pain on mastication for a variety of reasons such as masticatory muscle myositis (MMM), other inflammatory conditions affecting skeletal muscle, space-occupying diseases of the retroorbital region, TMJ disease, craniomandibular osteopathy, head trauma, ear disease, and neoplasia. MMM is typically diagnosed by detection of circulating antibodies against type 2M fibers in serum (2M-fiber antibody titer) and immune complexes bound to type 2M myofibers in muscle tissue (immunocytochemical assay). Samples can only be acquired via surgical muscle biopsies and laboratory results are not immediately available. This retrospective study was performed to determine the validity of computed tomography (CT) imaging in the diagnosis of MMM.

Methods: Eighteen dogs without history of recent trauma that presented with MMM signs and had a CT performed between 2000-2005 at the University of Pennsylvania were included. The following medical record parameters were evaluated: age, sex, breed, and weight of the dog; presenting complaint; chemical screen and complete blood count; specific tests for diagnosis of MMM (2M-fiber antibody titer and immunocytochemical assay); standard medical radiographs of the head; CT scans of the head; therapeutic management of the presenting complaint; and short- and long-term reexaminations.

Results: Seven dogs were diagnosed with MMM (positive 2M-fiber antibody titer and positive immunocytochemical assay). Other diagnoses included neoplasia (3 dogs), zygomatic salivary gland disease with secondary myositis (1), foreign body (1), temporal muscle abscess (1), polymyositis (1) and idiopathic perimyseal fibrosis (1). In 3 other dogs, a cause for difficulty to open the mouth was not found. CT features in MMM included local muscle atrophy and focal linear to patchy areas of contrast enhancement in different masticatory muscles that differed from imaging features in other above mentioned conditions.

Conclusions: CT is a helpful tool in ruling out differentials of MMM and defining suitable sites for muscle biopsy.

THE EFFECT OF CT IMAGE DISPLAY PARAMETERS ON THE DIAGNOSTIC CERTAINTY FOR ABNORMALITIES IN DOGS WITH ELBOW DYSPLASIA. T.C. Tromblee, J.C. Jones, A. Bahr, S.Aref, P.K. Shires. Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA 24061.

Introduction: Computed tomography (CT) is established as a sensitive imaging modality for diagnosis of canine elbow dysplasia, however clinically significant lesions may be overlooked if images are displayed using inappropriate window settings and/or planes. Currently there are no data-based recommendations for image display parameters to use in dogs with suspected elbow dysplasia. The purpose of this study was to test the effect of CT image display parameters on observers' diagnostic certainty for the presence or absence of CT abnormalities previously reported to be indicators of canine elbow dysplasia.

Methods: Medical records at Texas A&M University College of Veterinary Medicine were reviewed for dogs evaluated for elbow dysplasia. Criteria for inclusion were: large breed dogs (>20 kg) with lameness and pain isolated solely to one or both elbows, original archived CT image data of the elbows, and recorded arthroscopic or surgical findings from at least one elbow. Fifty arthroscopically explored elbows and ten clinically normal elbows were selected for the study. Original CT image data from selected elbows were filmed in transverse, sagittal and dorsal planes, with each plane filmed in window widths of 1500, 2500, and 3500 HU. Two board-certified veterinary radiologists, unaware of surgical findings, independently evaluated each set of films for: 1) hypoattenuating MCP subchondral defects, 2) *in situ* MCP fissure(s), 3) discrete MCP fragment(s), 4) irregularity and/or hypoattenuating defects of the radial incisure (RI), 5) subchondral sclerosis of the trochlea humeri, 6) osteochondrosis/OCD or kissing lesion, and 7) joint incongruity. Evaluators recorded their level of diagnostic certainty for the presence or absence of each CT abnormality using a visual analogue scale system (VAS). The effect of status (normal/abnormal), plane, or window on the degree of certainty was tested. Arcsin square root transformation of VAS scores provided estimation of observer diagnostic certainty for each CT abnormality.

Results: Overall, observers demonstrated higher degree of certainty determining normal elbows as normal rather than affected elbows as abnormal. Diagnostic certainty for MCP subchondral defects and *in situ* MCP fissures was highest in transverse plane in 2500 or 3500 HU. Certainty of discrete MCP fragmentation was high in transverse and sagittal planes regardless of window. Abnormalities of the RI were detected with highest certainty in the transverse plane regardless of window. Determination of trochlear sclerosis was affected by both plane and window; certainty for sclerosis was highest in dorsal plane in 1500 HU, but certainty of normality was highest in 3500 HU. Diagnostic certainty for presence of a kissing lesion or osteochondrosis was equivocal in most planes. Highest observer certainty for joint incongruity occurred in the sagittal plane regardless of window.

Conclusions: The authors recommend viewing transverse images in 3500 HU to diagnose hypoattenuating MCP subchondral defects and *in situ* fissures; dorsal images in 1500 HU to diagnose subchondral sclerosis; dorsal images to diagnose OCD or kissing lesions; transverse images to diagnose RI irregularity; transverse and sagittal images to diagnose MCP fragments; and sagittal images to diagnose humeroulnar joint incongruity.

USE OF INTRAVENOUS IODINE CONTRAST MEDIUM IN ABDOMINAL COMPUTED TOMOGRAPHY (CT) IN BIRDS. M. Gumpenberger, A. Bauer. Clinic of Radiology, University of Veterinary Medicine, 1210 Vienna, Austria

Introduction/Purpose: Abdominal radiographs of birds give a good overview but the diagnostic value may be limited due to poor serosal detail. Although gastrointestinal contrast studies improve differentiation of organs, superimposition or opacification of the abdomen often hinders accurate diagnoses. Ultrasonography is established for soft tissue evaluation but may be limited due to the patient's size or air sac system. CT is able to overcome these disadvantages. Nevertheless coelomic detail is often poor in plain CTs. The purpose of the present study was 1) to find the best iodine contrast medium (CM) dosage, 2) to evaluate the persistence of CM enhancement and 3) to measure parenchymal enhancement, especially of the kidneys.

Methods: 30 clinically healthy domestic pigeons were placed in dorsal recumbency for plain transverse CT in contiguous 2 mm thick slices. Subsequently five probands received iodine CM Scanlux[®] 370mg/ml (Sanochemia Pharmazeutica AG) in a dosage of 0,1 ml/100g, 0,08 ml/100g, 0,05 ml/100g, 0,03 ml/100g, 0,02 ml/100g or 0,01 ml/100g BW i.v., respectively. The CT scans were repeated three times. Scanning time as well as subjective and objective contrast enhancement (measured in Hounsfield Units HU) of kidneys and ureters were evaluated. The results of this study were then used to examine patients like budgerigars and cockatiels which were suffering from space occupying abdominal masses.

Results: Iodine CM dosages of 0,1ml/100g, 0,08ml/100g, 0,05ml/100g and also 0,03ml/100g BW caused satisfying enhancement of parenchymal organs in birds. The enhancement was weaker or sometimes lacking with a dosage of 0,02 or 0,01ml/100g. Liver and heart were still difficult to differentiate. Therefore the kidneys were used as target organs for further evaluation. Densitometry of normal kidney parenchyma was 35 to 55 HU, after CM application up to 200 HU. The ureter was not visible in plain images but showed a density of 400 to 2000 HU after CM injection. Subjective very good contrast enhancement was judged when the HU increased more than 100 HU, good or fair when the HU increased more than 40 to 50 HU. Although intravenous needle placement was certain in all probands, one bird in each group showed no contrast enhancement. The CM enhancement was visible over the entire examination period of 15 minutes. Prolonged anesthesia time was not reasonable for the proband. No bird showed any adverse effects.

Discussion/Conclusions: Our final recommendation for intravenous iodine CM application is a dosage of 0,03 or 0,05ml/100g BW (equivalent to 0,3 to 0,5ml/kg) with 370 mg iodine/ml which is obviously much less than in dogs. Birds weighing less than 100g receive a single dose of 0,1ml contrast medium. The value of contrast enhancement was already proved with three budgerigars which were suffering from renal or liver neoplasia and one domestic pigeon with a renal cyst, respectively.

MAGNETIC RESONANCE IMAGING CHANGES IN THE EQUINE FOOT IN THE INITIAL ACTIVE STAGE OF LAMINITIS. JB Arble¹, JS Mattoon¹, WT Drost¹, JK Belknap¹, SE Weisbrode¹, RJ Hunt². ¹The Ohio State University, College of Veterinary Medicine, Columbus, OH. ²Hagyard, Davidson, McGee, Lexington, KY.

Introduction: Laminitis is an expensive and emotionally draining disease whose pathophysiology remains unclear. The appearance of chronic laminitis with magnetic resonance imaging (MRI) has been described but the usefulness of MRI in evaluating laminitis still remains questionable. Clinical assessment and radiographs are the standard for evaluation of laminitis despite the inability to visualize and evaluate the soft tissues that are directly affected. A description and assessment of MRI during the initial active phase of laminitis is necessary to evaluate MRI as a clinical tool and research aid as well as to advance our understanding of this disease and increase our abilities in treatment and prevention.

Materials and Methods: Seven feet from horses in the initial active stage of laminitis at the time of euthanasia and thirteen feet from horses without laminitis were imaged using a 4.7 T Bruker magnet. T2 weighted 3D GRE, T1, and proton density weighted images were obtained for each foot. Representative T2 3D GRE images from the proximal, middle and distal thirds of each foot were evaluated by two boarded veterinary radiologists and a boarded equine surgeon. All reviewers were blinded to the animals' clinical status and histological findings. Digital radiographs and MR images of the limbs were evaluated separately for evidence of laminitis and the resulting diagnoses were compared to the histological diagnosis using a logistical regression model to detect a match for each foot. Additionally, each MR image was examined for alteration of: corium heterogeneity, corium signal intensity, laminar homogeneity, laminar signal intensity and laminar separation. Each change was graded normal, mild, moderate or severe (1-4). Quantitative measurements of the MR images included: width of the corium, width of the lamina, width of the dermal tissue (lamina plus corium), ratio of lamina to total dermal tissue (lamina:dermis), and laminar pairs per 5mm. Measurements and rankings for each of the MR images (proximal, middle and distal) were evaluated for their ability to accurately predict the histological diagnosis for each foot using data plots and logistic regression.

Results: 1.) MRI diagnosis was slightly better than radiography with a marginal statistic significance ($p=0.0983$). 2.) Logistic regression results show that loss of proximal corium heterogeneity, middle and proximal lamina:dermis >0.70 , increased laminar signal intensity and separation of lamina significantly predict the histological diagnosis ($p<0.05$). Loss of heterogeneity in the mid and distal corium and lamina:dermis >0.70 in the distal foot all had perfect or near perfect prediction for histological laminitis.

Conclusions: 1.) MRI is a better modality than radiography in reaching an accurate diagnosis in the initial active stage of laminitis. 2.) Loss of corium heterogeneity and increased lamina:dermis above 0.70 are extremely sensitive and specific predictors of laminitis.

MAGNETIC RESONANCE IMAGING OF THE CANINE MENISCI

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Introduction/Purpose: Meniscal degeneration and tears are often associated with rupture of the cranial cruciate ligament in the canine stifle. The medial meniscus is less mobile than the lateral and is more prone to damage. Magnetic resonance imaging (MRI) is a valid tool for non invasive evaluation of the menisci. Recently, the following two sequences have been used to image the menisci in the dog; fast imaging with steady-state precession (FISP) 3D and proton density weighted turbo spin echo (PD TSE) sequences. However, these studies were not compared head-to-head, and different field strengths were used. The purpose of this study was to compare those two sequences using the same field strength and to describe the appearance of the normal menisci on MRI.

Methods: Five normal canine cadaver hind limbs were used. Each stifle was imaged with a FISP sequence (TR: 18, TE: 10, 0.7 mm slice thickness, FOV: 12x12 cm, matrix: 256x256, Flip angle 40⁰) in a sagittal plane and a PD TSE sequence (TR: 3040, TE: 34, 2 mm slice thickness, FOV: 10x10 cm, matrix: 256x230) in sagittal and dorsal planes. Transverse PD images (3mm) were also acquired with and without fat saturation. Images were evaluated by two radiologists and a radiology resident using a DICOM workstation. The stifles were then dissected for gross evaluation of the menisci.

Results: All the stifles were normal on MRI and gross histological evaluation. The menisci appeared as triangular shaped structures of low signal intensity between the cartilage of the tibial plateau and femoral condyle. Very detailed anatomic information was obtained with the FISP sequence but the signal of the menisci was slightly inhomogeneous and mottled. There was a constant bright signal at the separation between the tendon of the popliteus muscle and the lateral meniscus. With the PD TSE sequence the menisci are homogeneously hypointense and well delineated from the adjacent structures.

Discussion/Conclusion: Both sequences have advantages in imaging the canine menisci. The FISP sequence may be helpful in the diagnosis of altered shape. However the FISP sequence could lead to false positive interpretation of a lesion due to the mottled signal of the normal menisci and also to false negative detection of increased hydration. The PD TSE sequence, while giving good anatomic detail, may also have the capacity to better detect increased signal intensity in the menisci. MRI evaluation of diseased stifles with these sequences is necessary to determine their sensitivity in detection of meniscal lesions.

CLINICAL EXPERIENCE WITH MRI AT 3.0T Walsh B. Walsh Veterinary Imaging, Navan, Ireland and London, UK and Graham. J. Central Florida Veterinary Radiology, 9905 South US Highway 17-92, Maitland, FL 32751

Introduction: Magnetic resonance imaging systems have traditionally been divided into low field (0.05T to 0.5T) and high field (1.0T to 1.5T) systems. Higher field strength MR systems operating at 3.0T are more expensive to acquire and maintain and have only recently gained acceptance for clinical imaging. These systems have a number of technical advantages including improved signal to noise ratio, capacity to generate thin slices, improved spatial resolution and faster acquisition times.

Methods: The records of over 150 clinical cases were reviewed. Images were compared subjectively with studies from a 0.2T MR system and a 1.5T MR system.

Results: Image resolution was considered superior for some sequences at 3.0T. The average scan time at 3.0T was also shorter.

Discussion: The relative advantage of the higher signal to noise ratio of 3.0T MRI may be offset by other factors such as changes in relaxation times and increased susceptibility to artifacts such as motion or metal. No adverse effects were noted in any of our patients as a result of imaging at 3.0T

CORRELATION BETWEEN MRI AND HISTOLOGY OF BONE MARROW CHANGES IN THE PROXIMAL TIBIA IN 5 DOGS WITH EXPERIMENTALLY INDUCED OSTEOARTHRITIS. S. Martig¹, J. Boisclair², M. Konar¹, D. Spreng, J. Lang¹, Vetsuisse faculty¹, University of Bern, Switzerland and Novartis Pharma² Basel, Switzerland

Introduction: Signal changes within the bone marrow of the distal femur and the proximal tibia are commonly seen on MR images of the osteoarthritic knee in humans and in dogs. These lesions are usually referred to as “bone marrow edema” and are characterized by ill-defined areas of low signal intensity on T1-weighted images and of intermediate to high signal intensity on T2-weighted and fat suppressed images. Reports of histological examination of such lesions are rare and show bone marrow fibrosis and necrosis rather than bone marrow edema in humans. In dogs with transected cranial cruciate ligament (CCL) hematopoiesis, fibrosis and necrosis of fat marrow were found. The aim of this study was to correlate the bone marrow signal changes seen on MRI with histological findings in the proximal tibia of 5 dogs with experimentally induced osteoarthritis using the Pond-Nuki model.

Materials and Methods: In 5 skeletally mature Mongrel dogs the CCL of the left stifle was sectioned. MRI was performed 1,2,3,4,6,8, and 13 months post surgery on a 0.3T scanner. The following sequences were acquired in a dorsal plane: gradient echo T2*-w, STIR, gradient echo T1-w before and after intravenous administration of gadodiamid. Dogs were euthanised 13 months post surgery and histological specimen of the proximal tibia were prepared in dorsal planes. Regions with signal changes on MRI were evaluated on histological specimen and compared to the surrounding bone.

Results: On STIR images areas of increased signal intensity (SI) within the bone marrow were seen in all dogs in every examination in one or more locations of the proximal tibia and the distal femur. Lesions varied in size and location without any recognizable trend throughout the whole study. Most constantly seen were signal changes in the region of the tibial eminence. On T1-w images lesions demonstrated decreased SI and inhomogeneous contrast enhancement. On T2*-w images most lesions were isointense to the surrounding fat marrow. Histologically hematopoiesis and myxomatous transformation of the bone marrow and/or intertrabecular fibrosis were consistently found in the areas corresponding to the MRI signal changes. Zones with only moderately increased signal intensity on STIR images usually corresponded to myxomatous well vascularized connective tissue without the hematopoietic component or bone marrow fibrosis. Fibrosis was confined to the bone marrow immediately underneath the sclerotic subchondral bone or to the bone marrow within the osteophytes. No edema was found on any histological specimen.

Conclusion: Zones of increased SI on STIR images within the bone marrow do not necessarily represent bone marrow edema but can be due to an infiltration of cells other than fat cells and a decrease of the volume of the latter. The term “bone marrow edema” should not be used any more and should be replaced by “bone marrow abnormality”, “ill-defined signal intensity abnormality” or “edema-like MR imaging abnormality”. The etiology of bone marrow lesions within the osteoarthritic stifle joint remains open.