AMERICAN COLLEGE OF VETERINARY RADIOLOGY

2012 Annual Scientific Conference

October 18-21

M Resort Spa Casino
LAS VEGAS, NEVADA

PROGRAM COMMITTEE
Nathan Nelson, Program Chair
Federica Morandi, Program Co-Chair (Forum Focus)
Sheri Siegel, Program Co-Chair (Radiation Oncology)
Randi Drees, Program Co-Chair (Image Interpretation Session)
David Reese, Program Co-Chair (Meet the Residents Session)
Anthony Pease, President, Ultrasound Society
Clifford R. (Kip) Berry, President, Society of Veterinary Nuclear Medicine
Shannon Holmes, President, CT/MRI Society
Natasha Werpy, President, Large Animal Diagnostic Imaging Society
Jessica Winger, ACVR Meeting Manager
Susie Wilson, ACVR Administrator

ACVR ADMINISTRATION
Kari Anderson, President
Clifford R. (Kip) Berry, President - Elect
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Mary K. Klein, President, Radiation Oncology
Robert D. Pechman, Executive Director
Darryl N. Biery, Assistant Executive Director
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THE AMERICAN COLLEGE OF VETERINARY RADIOLOGY
GRATEFULLY ACKNOWLEDGES THE SUPPORT OF THE
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Program Overview
2012 ACVR Scientific Conference
October 18-21, 2012
M Resort Spa and Casino
Las Vegas, NV

Wednesday, October 17, 2012
8:00 am - 4:00 pm  Interventional Radiology Laboratory
Sponsored by Infiniti Medical
Offsite location

Thursday, October 18, 2012
7:00 am  Registration Opens
Registration Desk 1, Office A

8:00 am  ACVR Forum
Molecular and Functional Imaging Forum
Introductory Comments: Dr. Federica Morandi

8:10 am  PET/CT: Basics of Instrumentation, Radiopharmaceuticals and Routine Clinical Imaging in Humans
Dr. Landis Griffeth

9:10 am  Development and Execution of Offsite PET/CT Imaging Studies
Dr. Amy LeBlanc

10:10 am  Break

10:30 am  Initial Experiences with In-house PET/CT – Clinical Value, Procedural Notes and Current Research
Dr. Susan Kraft

11:30 am  “Conventional” Nuclear Medicine – Still Useful?
Dr. Greg Daniel

12:30 pm  Lunch on Your Own

1:30 pm  MRI Spectroscopy and Diffusion/Perfusion Imaging
Dr. James Sutherland-Smith

2:30 pm  Diffusion Tensor Imaging-Fractional Anisotropy to Fiber Tracking
Dr. Anthony Pease

3:30 pm  Break

3:50 pm  Final Discussion/Question and Answer Period

5:00 pm  Adjourn for the Day

5:00 pm  Poster Presentations Set-up  Messina

6:30 -8:30  Welcome Reception ACVR/VCS  Villaggio Del Sole Terrace #1
Friday, October 19, 2012

7:00 am  
**Registration Opens**  
Registration Desk 1, Office A

7:30 am  
Veterinary Ultrasound Society Meeting  
Milan 4, 5, 7, 8

8:00 am  
**Conference Welcome**  
Drs. Nathan Nelson and Andrew Vaughan  
2012 ACVR and VCS Program Chairs

8:10 am  
**ACVR/VCS Keynote Address**  
**PET/CT: Fundamentals and Clinical Applications in Humans**  
Dr. Landis Griffeth, MD, PhD  
Baylor University Medical Center

9:10 am  
Break with Exhibitors  
Molise

9:30 am  
**ACVR President Address**  
Dr. Kari Anderson

9:50 am  
Resident Authored Paper Award  
Milan 4, 5, 7, 8

10:00 am  
**Roundtable Discussion:**  
PACS and Teaching Library Management for the Radiologist Using Free and Open-Source Software

11:00 am  
General Radiology Scientific Session 1  
Milan 4, 5, 7, 8

12:00 pm  
*Lunch on Your Own*

1:00 pm  
General Radiology Scientific Session 2  
Milan 4, 5, 7, 8

2:00 pm  
**Roundtable Discussion:**  
The Use of Ultrasound Technicians

3:00 pm  
Break with Exhibitors  
Molise

3:30 pm  
Ultrasound Scientific Session 3  
Milan 4, 5, 7, 8

5:00 pm  
*Adjourn for the Day*

5:30 pm  
Meet the Residency Directors  
Milan 4, 5, 7, 8

6:30-8:30 pm  
Poster Presentations and ACVR/VCS Reception  
Messina
**Saturday, October 20, 2012 - ACVR**

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<th>Event</th>
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<tr>
<td>7:00 am</td>
<td>Registration Opens</td>
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<tr>
<td>7:30 am</td>
<td>Society of Veterinary Nuclear Medicine Meeting</td>
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<td>8:00 am</td>
<td>Nuclear Medicine/Ultrasound Scientific Session 4</td>
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<td>10:00 am</td>
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<td>Molise</td>
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<td>10:30 am</td>
<td>CT/MRI Scientific Session 5</td>
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<td>12:00 pm</td>
<td><em>Lunch on Your Own</em></td>
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<td>1:00 pm</td>
<td>ACVR Image Interpretation Session</td>
<td>Milan 4, 5, 7, 8</td>
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<tr>
<td>2:30 pm</td>
<td>Confirmation and Recognition of New ACVR Diplomates</td>
<td>Milan 4, 5, 7, 8</td>
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<tr>
<td>3:00 pm</td>
<td><em>Break with Exhibitors</em></td>
<td>Molise</td>
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<tr>
<td>3:30 pm</td>
<td>ACVR Business Meeting (Diplomates only)</td>
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<td>5:00 pm</td>
<td><em>Adjourn for the Day</em></td>
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<td>5:00 pm</td>
<td>Large AnimalDiagnostic Imaging Society Meeting</td>
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<td>7:00 pm - 10:00 pm</td>
<td>VCS Awards Reception</td>
<td>Palms Resort (Offsite)</td>
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<td>7:00 am</td>
<td>Registration Opens</td>
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<td>8:00 am</td>
<td>RO/VCS Joint Keynote Address</td>
<td>Milan 1, 2, 3, 6</td>
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<tr>
<td></td>
<td><strong>A Dog’s Life: What Can Animals Teach Us About Cancer?</strong></td>
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<td>Dr. Bruce Chabner, MD, PhD</td>
<td>Massachusetts General Hospital</td>
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<td>9:15 am</td>
<td>VRTOG/RO Scientific Session 1</td>
<td>Modena 1 - 3</td>
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<td>10:00 am</td>
<td>Break with Exhibitors</td>
<td>Molise</td>
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<tr>
<td>10:30 am</td>
<td>VRTOG/RO Scientific Session 2</td>
<td>Modena 1 - 3</td>
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<td><strong>Lunch on Your Own</strong></td>
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<td>1:00 pm</td>
<td>RO Business Meeting</td>
<td>Modena 1 - 3</td>
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<td>VCS Awards Reception</td>
<td>Palms Resort (Offsite)</td>
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</tbody>
</table>
Sunday, October 21, 2012

7:00 am  Registration Opens and CE Certificates Available
         Registration Desk 1, Office A

7:30 am  CT/MRI Society Meeting
         Milan 4, 5, 7, 8

8:00 am  CT/MRI Keynote Address
         Milan 4, 5, 7, 8
         CT Angiography
         Geoffrey Rubin, MD
         Duke University Medical Center

9:00 am  CT/MRI Scientific Session 6
         Milan 4, 5, 7, 8

10:00 am Break with Exhibitors
         Molise

10:30 am CT/MRI Scientific Session 7
         Milan 4, 5, 7, 8

12:00 pm Lunch on Your Own

1:00 pm  Topics in Equine Imaging
         Milan 4, 5, 7, 8

3:00 pm  Break with Exhibitors
         Molise

3:30 pm  Large Animal Scientific Session 8
         Milan 4, 5, 7, 8

4:30 pm  Meeting Concludes
Wednesday, October 17, 2012

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Milan 4, 5, 7, 8

9:50 am  Resident Authored Paper Award  
Milan 4, 5, 7, 8

10:00 am  *Roundtable Discussion:*  
**PACS and Teaching Library Management for the Radiologist Using Free and Open-Source Software**  
Dr. Rob McLear  
Dr. Allison Zwingenberger  
Dr. Ian Robertson  
Milan 4, 5, 7, 8

11:00 am  *General Radiology Scientific Session 1*  
(Moderator: Dr. Elizabeth Ballegeer)  
Milan 4, 5, 7, 8

11:00 am  **ASSOCIATION OF THORACIC RADIOGRAPHS AND SEVERITY OF PULMONARY ARTERIAL HYPERTENSION DIAGNOSED IN 66 DOGS VIA DOPPLER ECHOCARDIOGRAPHY: A RETROSPECTIVE STUDY.**  

11:12 AM  **NORMAL STERNAL MENSURATION OF THE CARDIAC SILHOUETTE (STERNEBRAL CARDIAC SILHOUETTE SCALE) IN SIX BREEDS OF NORMAL DOGS BASED ON THE RIGHT LATERAL RADIOGRAPH.**  
Erin Carr, Clifford R. Berry, Matthew D. Winter. UF | Veterinary Hospitals, Department of Small Animal Clinical Sciences, University of Florida, Gainesville, FL 32610.

11:24 am  **RADIOGRAPHIC INTERPRETATION OF LIVER SIZE IN DOGS.**  
A. Weissman, S.P. Holmes, J. Smith, A.M. Jeffers, D. Jimenez. University of Georgia - College of Veterinary Medicine, Georgia, 30602.
11:36 am  **COMPARISON OF DIGITAL RADIOGRAPHY, ULTRASOUND AND VAGINOURETHROGRAPHY IN THE DETERMINATION OF REPRODUCTIVE STATUS OF FERAL AND SHELTER QUEENS.** L. Pack, M.L. Woodland, B. Crane, P.M. Rist. Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, PE, C1A 4P3.

11:48 am  **RADIOGRAPHIC DIAGNOSIS OF MECHANICAL OBSTRUCTION IN DOGS BASED ON RELATIVE SMALL INTESTINAL LUMINAL DIAMETERS.** C. Finck, MA. d’Anjou, K. Alexander, G. Beauchamp. Faculty of veterinary medicine, Université de Montréal, 3200 rue Sicotte, St-Hyacinthe (QC), J2S 7C6 Canada.

12:00 pm  *Lunch on Your Own*

1:00 pm  **PAPERS © ORGANIZATION AND SOCIAL NETWORKING FOR YOUR DATA.** E.D. Brochtrup. Kansas State University, Kansas, 66502.

1:12 pm  **WHAT DO ABNORMAL GAS ACCUMULATIONS IN MARINE MAMMALS MEAN?** S.E. Dennison1,2,3, M. Moore4, J. St. Leger5, K. Danil6, M. Flannery7, T. Rowles8.

1:24 pm  **AN ARTIFACTUAL RADIOLUCENT LINE ON POSTOPERATIVE RADIOGRAPHS IN DOGS FOLLOWING TIBIAL PLATEAU LEVELLING OSTEOTOMY.** J. Olive, N. Chailleux, M. Thiery, L. Blond. CHUV, Faculty of Veterinary Medicine, Montreal University, QC, J2S5Z5, Canada.

1:36 pm  **PREVALENCE, HISTOPATHOLOGICAL CORRELATION, AND POTENTIAL SIGNIFICANCE OF A TIBIAL TUBERCLE RADIOLUCENCY IN DOGS.** M. Paek, J.B. Engiles, W. Mai. School of Veterinary Medicine Section of Radiology University of Pennsylvania, PA, 19104.

1:48 pm  **COMPARISON OF THE ACCURACY, TIMING AND ERGONOMICS OF A WIIMOTE TO A STANDARD COMPUTER MOUSE FOR IMAGE INTERPRETATION.** A.R. zur Linden1, R.T. Stone2, A. Clemens2, College of Veterinary Medicine1, College of Engineering2, Iowa State University, Ames, IA, 50011.

2:00 pm  *Ultrasound Roundtable Discussion: The Use of Ultrasound Technicians* (Moderator: Dr. Anthony Pease)

3:00 pm  *Break with Exhibitors*  Molise
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
</tr>
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<tbody>
<tr>
<td>3:30</td>
<td>THE SONOGRAPHIC APPEARANCE OF GASTROINTESTINAL LYMPHOMA IN DOGS. M. Frances, A. Lane, Z. Lenard, Perth Veterinary Specialists, Perth, Western Australia 6017.</td>
</tr>
<tr>
<td>3:42</td>
<td>ULTRASONOGRAPHIC EVALUATION OF THE RELATIVE THICKNESS OF WALL LAYERS IN THE CANINE INTESTINAL TRACT. N.E. Geyer, D.G. Penninck, C.R.L. Webster. Cummings School of Veterinary Medicine, Tufts University, North Grafton, MA 01536.</td>
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<tr>
<td>4:06</td>
<td>ULTRASONOGRAPHIC AND CLINICOPATHOLOGICAL FEATURES OF FELINE GASTROINTESTINAL EOSINOPHILIC SCLerosING FIBROPLASIA. A. Weissman¹, D. Penninck², C. Webster², S. Hecht³, J. Keating², L.E. Craig³. ¹University of Georgia College of Veterinary Medicine Department of Anatomy and Radiology, Athens, Georgia, 30602. ²Cummings School of Veterinary Medicine, Tufts University Department of Clinical Sciences, North Grafton, MA 01536. ³University of Tennessee College of Veterinary Medicine Department of Small Animal Clinical Sciences, Knoxville, TN 37996.</td>
</tr>
<tr>
<td>4:18</td>
<td>ULTRASONOGRAPHIC APPEARANCE OF THE OUTER MEDULLAR OF CANINE KIDNEYS IN DOGS WITHOUT CLINICAL EVIDENCE OF RENAL DISEASE. DJ VanderHart, CR Berry, MD Winter, DJ Reese, SL Reese, JA Conway. UF Veterinary Hospitals, University of Florida, Gainesville, FL 32610.</td>
</tr>
<tr>
<td>4:30</td>
<td>EFFECT OF SPATIAL COMPOUND IMAGING ON RENAL CORTICAL ANISOTROPY ARTIFACT IN DOGS. J.D. Ruth, H.G. Heng, P.D. Constable. Purdue University College of Veterinary Medicine, West Lafayette, Indiana 47907.</td>
</tr>
<tr>
<td>4:42</td>
<td>CORRELATION BETWEEN ULTRASONOGRAPHIC PATTERN OF GALLBLADDER MUCOCELE AND CLINICAL SIGNIFICANCE IN DOGS. A.Y. Kim¹, J.Y. Oh², S.Y. Keh¹, H.W. Kim¹, D.W. Chang³, H.J. Choi¹, J.H. Choi¹. ¹Haemaru Referral Animal Hospital, Seongnam, South Korea 463-050. ²College of Veterinary Medicine, Chonnam National University, Gwangju, South Korea 500-757. ³College of Veterinary Medicine, Chungbuk National University, Cheongju, South Korea 361-763. ⁴College of Veterinary Medicine, Chungnam National University, Daejeon, South Korea 305-764.</td>
</tr>
<tr>
<td>5:00</td>
<td>Adjourn for the Day</td>
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<tr>
<td>5:30</td>
<td>Meet the Residency Directors Milan 4, 5, 7, 8</td>
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STUDENTS’ AND RECENT GRADUATES’ PERCEPTIONS OF RESOURCES FOR LEARNING VETERINARY RADIOLOGY. K. Alexander*, S. Dallaire*, M. Bélisle, N. Fernandez, M. Doucet. Faculté de médecine vétérinaire, Centre d'études et de formation en enseignement supérieur (CEFES), Centre de pédagogie appliquée aux sciences de la santé (CPASS), Université de Montréal and *Léger Marketing, Montreal, Québec, Canada.

DETERMINATION OF TIME TO MAXIMAL T1 ENHANCEMENT AND EFFECT ON SIGNAL INTENSITY IN T2 WEIGHTED IMAGES OF A HEPATOBILIARY MR CONTRAST AGENT (GADOXETIC ACID) IN HEALTHY DOGS. A.K. Bratton, S.G. Nykamp, R. Cruz-Arambulo, T.W.G. Gibson, S.A. Kruth. Ontario Veterinary College, University of Guelph, Ontario, Canada, N1G 2W1.


CT MORPHOMETRY OF PARASPINAL MUSCLES IN LABRADOR RETRIEVERS WITH VERSUS WITHOUT LUMBO SACRAL PAIN. B. Francis, J. Jones, B. Pierce, K. Childs, P. Grimm, M. Mukherjee. West Virginia University, WV, 26506-6108; Virginia-Maryland Regional College of Veterinary Medicine, VA, 24061-0442; Department of Defense Military Working Dog Veterinary Service, TX, 78236.

PRESENCE OF ATLANTO AXIAL LIGAMENTOUS ABNORMALITIES ON MAGNETIC RESONANCE IMAGES IN DOGS WITH AND WITHOUT CHIARI-LIKE MALFORMATION. E.B. Garcia, N. Rademacher, A. Shores and L. Gaschen. Louisiana State University School of Veterinary Medicine, Baton Rouge, LA, 70803, USA. Mississippi State College of Veterinary Medicine, Starkville, MS, 39762, USA.


RADIOGRAPHIC VISIBILITY AND MEASUREMENTS OF CAUDAL LOBAR PULMONARY VESSELS IN HEMODYNAMICALLY NORMAL CATS. T. Gregori, N.X. Harran, V. Barberet, D. Casamian Sorrosal. Clinical Veterinary Science, Division of Companion Animals, University of Bristol, Langford, BS40 5DU, United Kingdom.
MAGNETIC RESONANCE IMAGING (MRI) SPINAL CORD AND CANAL MEASUREMENTS IN NORMAL DOGS. S. Hecht¹, M. M. Huerta¹, R. B. Reed². Department of Small Animal Clinical Sciences¹ and Department of Biomedical and Diagnostic Sciences², University of Tennessee College of Veterinary Medicine, Knoxville, TN, USA.

COMPUTED TOMOGRAPHIC ANATOMY OF THE THORAX OF THE LIVE COMMON BOTTLENOSE DOLPHIN. M. Ivančić¹, M. Solano², C.R. Smith¹. ¹National Marine Mammal Foundation, San Diego, CA 92106 and ²Cummings School of Veterinary Medicine, Tufts University, North Grafton, MA 01536.

MODEL SYSTEMS FOR INVESTIGATION OF TREATMENT OPTIONS FOR FELINE INJECTION SITE SARCOMA. Petznek¹, M. Kleiter¹, M. König-Schuster¹, M. Renner¹, C. Hohenadl¹. ¹University of Veterinary Medicine, Vienna, A-1210; ²Marinomed Biotechnologie GmbH, A-1210, Austria.

MEDICAL INFRARED IMAGING (THERMOGRAPHY) IN CATS WITH HYPERTHYROIDISM. D.J. Marino. Long Island Veterinary Specialists, New York, 11803.

EFFECT OF UPPER AIRWAY OBSTRUCTION ON THORACIC WALL CONFORMATION IDENTIFIED ON ROUTINE THORACIC RADIOGRAPHS. J.S. Matheson, K. Stadler. University of Illinois-Urbana-Champaign, Illinois, USA 61802.

COMPARISON OF RADIOGRAPHIC AND COMPUTED TOMOGRAPHIC MEASUREMENTS OF TRACHEAL DIAMETER AND LENGTH IN DOGS. J.E. Montgomery⁸, K.G. Mathews⁹, D.J. Marcellin-Little⁸, S. Hendrick⁸, J.C. Brown⁸. ⁸Western College of Veterinary Medicine, University of Saskatchewan, 52 Campus Dr. Saskatoon, SK, S7N 5B4, ⁹College of Veterinary Medicine, North Carolina State University, 4700 Hillsborough St., Raleigh, NC, 27606.


ASSESSMENT OF RESPIRATION INDUCED DISPLACEMENT OF CANINE ABDOMINAL STRUCTURES IN DORSAL VERSUS VENTRAL RECUMBENCY USING COMPUTED TOMOGRAPHIC IMAGING. C.R. Oliveira¹, R. Drees¹, M.A. Henzler². ¹School of Veterinary Medicine, and ²School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI, 53706.

FEASIBILITY FOR USING DUAL-PHASE CONTRAST-ENHANCED MULTIDETECTOR HELICAL CT TO EVALUATE AWAKE AND SEDATED DOGS WITH ACUTE ABDOMINAL SIGNS. M.M. Shanaman, S.K. Hartman, R.T. O’Brien. Department of Veterinary Clinical Medicine, University of Illinois at Urbana-Champaign, IL, 61802.

THREE CASES OF ENLARGED UTERUS MASCELLINUS DIAGNOSED VIA ULTRASOUND. J.H. Sheridan, H.G. Heng, J.D. Ruth, L.G Adams, C. Thompson, and M. Childress. Purdue University, College of Veterinary Medicine, Department of Veterinary Clinical Sciences, IN 47907.

VOLUMETRIC ESTIMATION OF THE PROSTATE GLAND USING COMPUTED TOMOGRAPHY IN NORMAL BEAGLE DOGS. Y.M. Song, H.C. Lee, J.Y. Lee, J.W. Lee, W.C. Jung, S.Y. Choi, I. Lee, W.S. Choi, D.W. Chang, Y.W. Lee, H.J. Choi. College of Veterinary Medicine, Chungnam National University, Daejeon, South Korea 305-764; College of Veterinary Medicine, Gyeongsang National University, Jinju, South Korea 660-701; College of Veterinary Medicine, Chungbuk National University, Cheonju, South Korea 361-763.

COMPUTED TOMOGRAPHIC FEATURES OF PRESUMPTIVELY NORMAL ABDOMINAL LYMPH NODES IN DOGS. J.E. Stein, R. Drees. University of Wisconsin-Madison School of Veterinary Medicine, Department of Surgical Sciences, Madison, WI., 53706.


THORACIC RADIOGRAPHIC ANATOMY IN VERVET MONKEYS (CHLORoceBUS SABAEUS). A.N. Young, D. Rodriguez, W.M. du Plessis. Ross University, School of Veterinary Medicine, Basseterre, St. Kitts and Nevis.

OPTIMISED MULTISLICE COMPUTED TOMOGRAPHIC (CT) PROTOCOL FOR THE NORMAL CANINE BRAIN. M. Zarelli, T. Schwarz, A. Puggioni, M. Pinilla, H. McAllister. UCD, Ireland, The Royal (Dick) School of Veterinary Studies, Edinburgh, Scotland and Southern Counties Veterinary Specialists, Ringwood, UK.

RADIOGRAPHIC, CLINICAL AND CLINICOPATHOLOGICAL FEATURES OF ANGIOSTRONGYLOSIS IN DOGS FROM IRELAND. M. Zarelli; B. Gallagher; S. Brennan; C. Mooney. University College Dublin, D4, Ireland.

MULTI-DE TECTOR CT UROGRAPHY PROTOCOL DESIGN AND OPTIMIZATION. A.R. zur Linden, E.A. Riedesel, K. Alexander. College of Veterinary Medicine, Iowa State University, Ames, IA, 50011; Faculté de médecine vétérinaire, Université de Montréal, St-Hyacinthe, Québec, Canada, J2S 7C6.
ASSOCIATION OF THORACIC RADIOGRAPHS AND SEVERITY OF PULMONARY ARTERIAL HYPERTENSION DIAGNOSED IN 66 DOGS VIA DOPPLER ECHOCARDIOGRAPHY: A RETROSPECTIVE STUDY.

Introduction/Purpose: Echocardiography is a non-invasive method for diagnosing PAH. PAH is commonly graded as mild, moderate, or severe using tricuspid regurgitation velocity and modified Bernoulli equation. Thoracic radiographs for evaluation of cardiac silhouette and pulmonary arterial vasculature and parenchyma often accompany these exams. No current literature correlates thoracic radiographic findings to severity of PAH. We hypothesize that the more severe the PAH, the greater the number and conspicuity of radiographic findings suggestive of hypertension.

Methods: Inclusion criteria consisted of dogs with suspected PAH that had echocardiographic and thoracic radiographic examinations performed within a 24 hour interval. A group of normal dogs were included for control. The radiographs of PAH and control dogs were randomized and scored by three board certified radiologists blinded to the echocardiographic results for the following: right ventricular enlargement, main pulmonary artery (MPA) enlargement, and lobar pulmonary artery enlargement, tortuosity, and blunting. A “reverse D” appearance, elevation of the cardiac apex, and an estimation of right (3/5) to left (2/5) heart ratio on the lateral projection were utilized to determine right ventricular enlargement. A soft tissue bulge at the 1-2 o’clock position of the heart was utilized to determine main pulmonary artery enlargement. Comparison of the cranial lobar arteries to the 4th ribs on a lateral and comparison of the caudal lobar arteries to the 3rd and 9th ribs on a DV/VD projection were utilized to evaluate lobar artery enlargement. Tortuosity and blunting were subjectively evaluated. Presence or absence of each finding was scored "1" or "0" respectively for a cumulative score in the range of 0-9 for each dog. Cumulative scores per dog by each reviewer were averaged to determine a mean score for each grade of PAH.

Results: Seventy-seven dogs were included in the study, of which 20 were mild, 21 moderate, 25 severe, and 11 absent (control) PAH dogs. The presence of the following radiographic findings (expressed as a percentage) increased as PAH severity increased: A. Reverse D (mild 36%, moderate 39%, severe 49%, absent 0%); B. 3/5-2/5 ratio (mild 33%, moderate 42%, severe 51%, absent 6%); C. MPA enlargement (mild 26%, moderate 37%, severe 48%, absent 12%); D. Caudal lobar artery enlargement by 3rd rib method (mild 44%, moderate 51%, severe 59%, absent 9%). Mean scores for PAH grade were: mild (1.91), moderate (2.27), severe (2.84), and absent (0.39).

Discussion/Conclusion: The radiographic evidence of right ventricular, main pulmonary artery, and caudal pulmonary lobar artery enlargement by some of the evaluation methods tended to increase along with severity of PAH. However, even for severe PAH cases the presence of any particular finding only occurred in approximately one-half of cases, indicating a single radiographic finding should not be utilized to determine PAH severity. On the other hand, the presence of multiple findings is suggestive of an increased severity of PAH.
NORMAL STERNAL MENSURATION OF THE CARDIAC SILHOUETTE (STERNEBRAL CARDIAC SILHOUETTE SCALE) IN SIX BREEDS OF NORMAL DOGS BASED ON THE RIGHT LATERAL RADIOGRAPH.
Erin Carr, Clifford R. Berry, Matthew D. Winter. UF | Veterinary Hospitals, Department of Small Animal Clinical Sciences, University of Florida, Gainesville, FL 32610-0102.

Introduction/Purpose: Increased cardiac silhouette sternal contact (CsSC) has been reported in dogs to be an indicator of right ventricular enlargement. However, an objective method for determining CsSC has not been defined. The purpose of this study was to establish an objective measure of sternal contact for 6 different breeds of dogs; Dachshunds, Poodles, Golden Retrievers, Labradors, Doberman and Greyhounds.

Methods: A total of 161 sets of thoracic radiographs from 6 breeds of dogs without prior cardiac abnormalities were analyzed. The sternebral cardiac silhouette scale (SCsS) was defined as a parallel line drawn dorsal to the 6th sternebrae; the line was then moved dorsally until it touched the ventral most aspect of the cardiac silhouette. The linear measure of contact between the cardiac silhouette and the ventral line was recorded and then measured against the thoracic vertebrae (v) starting at T4, using a method as previously described for calculating the vertebral heart score (VHS). A non-parametric Kruskal-Wallis Test was used to determine significant differences between VHS and SHS in the 6 breeds evaluated. A p-value of < 0.05 was considered significant.

Results: The SCsS mean v (vertebrae) ± SD for each breed were: Dachshund 2.2v ± 0.6; Poodle 2.2v ± 0.5; Golden Retriever 1.4v ± 0.4; Greyhound 1.4v ± 0.5; Labrador 1.3v ± 0.3 and Doberman 0.7v ± 0.2. Significant differences of SHS (all p values < 0.01) were noted between most breeds except between the following: poodle and dachshund, and between the Golden Retriever, Labrador retriever and the Greyhound groups. In the Doberman pinscher, the SCsS was the smallest and was significantly different (p < 0.01) from all other breeds evaluated in this study. The SCsS was larger in small breeds (Dachshunds, Poodles) and smaller in the large dog breeds evaluated (Doberman, Greyhound, Golden Retriever, Labrador retriever). The VHS between the different breeds was not significantly different except the Greyhound breed was noted to be significantly greater compared to the Poodle and Doberman pinscher groups (p < 0.01) as previously described.

Discussion/Conclusion: This initial study has shown differences in the SCsS for 6 dog breeds. Further investigation is needed in order to understand the potential role that this measurement may have for helping to determine right or left sided cardiac abnormalities in the dog.

RADIOGRAPHIC INTERPRETATION OF LIVER SIZE IN DOGS.
A. Weissman, S.P. Holmes, J. Smith, A.M. Jeffers, D. Jimenez. University of Georgia - College of Veterinary Medicine, Georgia, 30602.

Introduction/Purpose: Classic radiographic evaluation of hepatic size has relied upon three subjective criteria: gastric axis position, caudoventral hepatic margin and caudoventral hepatic position relative to the costal arch. In a canine population with both normal and abnormal hepatic screening examinations, the objectives of this study were to compare the subjective assessment of liver pathology, determine how the classic methods of hepatic measurement relate to liver enzymes and the subjective assessment of liver size, and develop a novel objective measurement of hepatic size.

Methods: Dogs with a normal abdominal ultrasound, ALT, and ALP (n=21) and dogs with abnormal abdominal ultrasound and/or ALT and ALP (n=19) were included. Orthogonal abdominal radiographs were reviewed by two ACVR diplomats and one radiology resident. Reviewers subjectively assessed hepatic size and the three classic criteria were evaluated for each patient. A novel objective measurement of hepatic size, the vertebral liver score (VLS), was tested. The VLS was defined on the lateral projection as the distance from the point where the ventral margin of the caudal vena cava crossed the diaphragm, to the caudoventral tip of the liver, relative to the length of L2.

Results: Forty dogs with a mean age of 6.0 years (0.5-14.1 years) and mean weight of 15.1 kg (1.0-42.5 kg) were included in the study. In cases when reviewers were of uniform opinion, they correctly correlated subjective radiographic hepatic size with liver enzymes in 12/14 (86%) normal dogs and 5/15 (33%) abnormal dogs. Inter-reviewer variability was not significantly affected by experience. None of the classic criteria individually (T-test, \( p \geq 0.07 \)) or in combination (3-way ANOVA, \( p \geq 0.23 \)) were a reliable predictor of liver pathology. Based on Odds Ratios, each reviewer weighted the classic criteria differently and no pattern in weighting emerged superior in the prediction of liver pathology. When measuring the VLS, the variability among reviewers was approximately 7% of the average measurement. The VLS was a significant predictor of ALT and ALP (\( p = 0.03 \) and 0.0006, respectively). The VLS 95% prediction interval was determined to be 2.6-6.5 for dogs with normal liver enzymes and abdominal ultrasound.

Discussion/Conclusion: Reviewers were more likely to correctly predict normal than abnormal liver values. The three classic criteria had high inter-reviewer variability and none, alone or in combination, were a significant predictor of liver enzyme alterations. The VLS proved to be a highly reproducible objective measurement for discriminating between normal and abnormal liver enzymes. The application of the normal VLS range of 2.6-6.5 is potentially superior to classic subjective interpretation criteria when screening for liver pathology. A larger sample size is needed to confirm the strength of this finding.
COMPARISON OF DIGITAL RADIOGRAPHY, ULTRASOUND AND VAGINO-UРЕTHROGRAPHY IN THE DETERMINATION OF REPRODUCTIVE STATUS OF FERAL AND SHELTER QUEENS.
L. Pack, M. L. Woodland, B. Crane, P.M. Rist. Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, PE, C1A 4P3.

Introduction/Purpose: Many cats that are presented to feral cat spay/neuter programs or shelters have an unknown medical history. It is not always possible to identify female cats which have undergone previous ovariohysterectomy based on physical examination alone, necessitating surgery. It would be advantageous to have an easy, cost-effective method for screening female cats for reproductive status to avoid performing an unnecessary exploratory laparotomy.

Methods: A prospective randomized study on 50 recently euthanized female cats of unknown medical history and reproductive status was performed. Digital abdominal radiography, digital abdominal radiography with compression, abdominal ultrasonography and positive contrast vaginourethrography was performed in sequence by a board certified radiologist and a second-year radiology resident. Immediately following these procedures, necropsy was performed. Sensitivity, specificity, positive predictive value, negative predictive value and McNemar’s test statistic were calculated to compare the use of different modalities for determining the reproductive status of cats with unknown medical history.

Results: In the current study population of 50 cats, ultrasound had the highest sensitivity (87%) for determining reproductive status of all the imaging modalities tested. The specificity was 83%, and the positive predictive value and negative predictive value were 94% and 67%, respectively. The calculated sensitivities and specificities of the other modalities were as follows: digital radiographs (32%, 100%), digital compression radiographs (55%, 100%) and vaginourethrogram (37%, 100%). Based on McNemar’s test statistic, there was a significant difference in the sensitivities of ultrasound compared to digital radiographs, compression radiographs and vaginourethrogram.

Discussion/Conclusion: Ultrasound was the imaging modality with the highest sensitivity for correctly identifying intact queens. Although radiography and vaginourethromgrams are more readily available imaging modalities in private practice and shelter situations, due to poor sensitivity, they are not reliable predictors of reproductive status.
RADIOGRAPHIC DIAGNOSIS OF MECHANICAL OBSTRUCTION IN DOGS BASED ON RELATIVE SMALL INTESTINAL LUMINAL DIAMETERS.
C. Finck, MA. d’Anjou, K. Alexander, G. Beauchamp. Faculty of veterinary medicine, Université de Montréal, 3200 rue Sicotte, St-Hyacinthe (QC), J2S 7C6 Canada.

Introduction/Purpose: While ultrasonography provides superior accuracy for identifying intestinal obstruction, radiography remains a pertinent technique allowing a global assessment of intestinal contents and diameters. Several studies focused on the use of anatomical landmarks, and particularly the height of L5 vertebral body, to discriminate dogs requiring surgery. However, the potential value of comparing intestinal diameters for predicting obstruction has not been reported.

Methods: Abdominal digital radiographs of dogs with acute vomiting, due to obstructive (group 1, n=25) or non-obstructive (group 2, n=25) processes were retrospectively assessed blindly and randomly. Small intestinal (SI) maximal diameter (SI\textsubscript{max}) was measured and compared to the height of L5 vertebral body, to the minimal SI diameter (SI\textsubscript{min}), and to the estimated average of SI diameters using 2 intestinal loops considered representative (SI\textsubscript{med}), forming 3 ratios, R1, R2 and R3, respectively. Finally, the pattern of SI ileus was defined as segmental when involving less than 25% of SI, regional when 25-50% of loops were affected, or diffuse when >50%

Results: Ratios were significantly higher with SI obstruction. Using receiver operating curve (ROC) analysis, optimal thresholds for diagnosing mechanical ileus were the following: R1≥1.8 (Se92%, Sp84%), R2≥2.3 (Se88%, Sp84%), R3≥1.5 (Se80%, Sp80%). All ratios and thresholds considered, R1 and R3 respectively with thresholds ≥2.4 (Se 68%) and ≥1.9 (Se 64%) allowed the diagnosis of a greater number of true positives (dogs with true mechanical ileus and none without); R2 ≤2.0 (Sp 68%) allowed the diagnosis of a greater number of true negatives (dogs without true mechanical ileus and none with), [95% confidence intervals]. Segmental ileus was significantly more prevalent in obstructed dogs p<0.008), while diffuse ileus was significantly more prevalent for non-obstructed dogs.

Discussion/Conclusion: Ratios comparing SI maximal diameter to other intestinal segments or to L5 all enable a reliable discrimination of mechanical obstruction from non-obstructive processes. The pattern of SI ileus can also help in discriminating dogs that require surgery from dogs in which a conservative approach can be recommended.
PAPERS ® ORGANIZATION AND SOCIAL NETWORKING FOR YOUR DATA.
E.D. Brochtrup, Kansas State University, Kansas, 66502.

Introduction/Purpose: Radiologists are bombarded daily with incredible amounts digital media and information, as well as multitudes of print media. Processing this information is hard enough, but organizing it all in a manner in which it is easily searched, retrieved, and notated can be a daunting task. There are a multitude of PDF readers which allow storage and annotation abilities for digital articles. There are multiple differing search engines that allow for retrieval of digital and print articles. And there are varying methods such as file trees or commercially available programs designed for storing and minimal organization of large numbers of PDF style articles.

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WHAT DO ABNORMAL GAS ACCUMULATIONS IN MARINE MAMMALS MEAN?
S.E. Dennison1,2,3, M. Moore4, J. St. Leger5, K. Danil6, M. Flannery7, T. Rowles8.
1Marine Mammal Radiology, San Francisco, CA 94107, 2Animal Scan, Redwood City, CA 94063, 3University of Wisconsin, School of Veterinary Medicine, Madison, WI 53707, 4Woods Hole Oceanographic Institution, Woods Hole, MA 02543, 5Seaworld, San Diego, CA 92109, 6Southwest Fisheries Science Center, La Jolla, CA 92037, 7California Academy of Science, San Francisco, CA 94118, 8NMFS, Silver Spring, MD 20910.

Introduction/Purpose: Abnormal gas accumulations found in cetaceans that died following exposure to Naval sonar suggested that this might indicate that sonar was the cause of the stranding and led to a policy of imaging dead stranded cetaceans to evaluate for abnormal gas when sonar-related stranding is suspected. Our purpose was to determine if the presence of abnormal gas was sonar-specific.

Methods: Cetaceans that were healthy or stranded unrelated to Naval sonar exercises were opportunistically evaluated for abnormal gas accumulations. Cetaceans were divided into the following groups: 1) stranded live and released (ultrasound); 2) stranded live and died (ultrasound, CT, necropsy); 3) stranded dead (CT, necropsy); 4) captive (ultrasound, CT); 5) free-ranging healthy (ultrasound); 6) died due to known barotrauma (CT, gas analysis, necropsy); 7) stranded dead and imaged pre and post decapitation (CT, necropsy) and 8) stranded dead and allowed to decompose (serial CT, necropsy).

Results: 22/22 live stranded free ranging cetaceans had evidence of renal gas accumulations on renal ultrasound compared to 0/50 shallow water dwelling cetaceans. Of these 14/22 live stranded dolphins were released uneventfully indicating gas accumulations were asymptomatic in those dolphins. The remaining 8/22 underwent CT and necropsy that confirmed multifocal abnormal gas accumulations. 3/3 cetaceans that died due to known barotrauma had multifocal abnormal gas accumulations confirmed as air emboli on gas analysis. 9/9 cetaceans that stranded dead due to unknown causes had evidence of trauma to air-filled structures (aural or thoracic) and variable associated patterns of multifocal abnormal gas accumulations. Decapitation resulted in the widespread introduction of air. Decomposition resulted in progressive multifocal abnormal gas accumulations with the addition of marked intestinal dilatation.

Discussion/Conclusion: The asymptomatic presence of gas in live-stranded dolphins indicates that de novo formation can occur. In fresh dead animals that can be scanned intact, CT permits thorough evaluation of the distribution and amount of abnormal gas present. However caution must be exercised when interpreting the presence and likely etiology of that gas. Intestinal gas dilatation may indicate decomposition and little significance can be applied to gas within the head following decapitation. Correlation of imaging findings with gas analysis and histology is needed to ultimately determine the significance.
AN ARTIFACTUAL RADIOLUCENT LINE ON POSTOPERATIVE RADIOGRAPHS IN DOGS FOLLOWING TIBIAL PLATEAU LEVELLING OSTEOTOMY.
J. Olive, N. Chailleux, M. Thiery, L. Blond. CHUV, Faculty of Veterinary Medicine, Montreal University, QC, J2S5Z5, Canada.

Introduction/Purpose: The objective was to identify the cause of an occasional radiolucent line, which could be questionable for a fissure, in the proximal tibia on postoperative radiographs, after tibial plateau leveling osteotomy (TPLO) in dogs.

Methods: The study included a retrospective case series of 80 dogs (87 stifles) with cranial cruciate ligament rupture that had TPLO and an ex-vivo experiment in 4 canine tibia specimens. Medical records (2007-2010) and radiographs were reviewed and compared for dogs, whether they had or not a radiolucent line visible on postoperative radiographs. TPLO procedure was reproduced ex-vivo to try determining the origin of this line by direct inspection, use of metallic wires to identify bone contours and serial caudocranial radiographs at varying angles.

Results: Retrospectively, a medial curvilinear radiolucent line was visible in 16% of tibias, more commonly if the tibial plateau was fixed in slight medial translation relative to the tibial diaphysis and if caudocranial radiographs were made either in standard fashion or with the limb in slightly outward rotation. No complication was specifically associated with presence of this line. Ex-vivo, the line could be reproduced in one tibia and its cause was identified as a superimposition of the craniomedial osteotomy path with the tibial plateau.

Discussion/Conclusion: As a conclusion, this occasional artifactual radiolucent line was created by the craniomedial margin of the tibial osteotomy and should be recognized on TPLO postoperative radiographs to avoid delay in physiotherapy or unnecessary immobilization.
PREVALENCE, HISTOPATHOLOGICAL CORRELATION, AND POTENTIAL SIGNIFICANCE OF A Tibial Tubercle Radiolucency in Dogs.
M. Paek, J.B. Engiles, W. Mai. School of Veterinary Medicine Section of Radiology University of Pennsylvania, PA, 19104.

Introduction/Purpose: On lateral radiographs of the stifle in dogs, at the level of the proximal-cranial aspect of the tibia, a focal, ill-defined tibial tubercle radiolucency (TTR) is sometimes identified and was reported in textbooks to be of no clinical significance. The purpose of this study was to investigate its prevalence, histopathological correlation, and clinical association with conditions such as medial patellar luxation (MPL) and cranial cruciate ligament rupture (CCLR).

Methods: The electronic database was searched for all canine stifle radiographs over the past 5 years. One author blindly assessed all images for the presence of a TTR and subjectively graded it as mild, moderate, or marked. The medical records were then evaluated for the signalment and underlying stifle condition. Dogs were categorized into two groups based on breed size: group 1) toy and small breeds or group 2) medium, large, and giant breeds. Additionally, four small breed dogs that were euthanized for unrelated causes underwent radiographs, computed tomography (CT), and histopathology of the stifles. Two of the cadavers had normal stifles while two of the cadavers had TTRs with MPLs.

Results: A TTR was found in 145/675 (21.5%) dogs, of which 78 had an MPL, 57 had a CCLR and the remaining had varying diagnoses. Multinomial logistic regression showed a significant association between TTR and type of stifle disease (p<0.0001), or breed size (p=0.040), but not with sex (p=0.575). In our study group, dogs with a TTR had higher odds of having an MPL than dogs without (OR=9.854, p<0.0001, 95% CI 6.422-15.120). There was no association between the severity of the TTR and grade of MPL ($\chi^2$, p=0.945). Dogs with a TTR had lower odds of having a CCLR than dogs without TTR (OR=0.418, p<0.0001, 95% CI 0.287-0.609). Toy and small breed dogs had a higher prevalence of a TTR compared with medium to giant breed dogs (33.1% vs. 18.9% respectively, $\chi^2$, p<0.0001). When the analysis was stratified by dog size, there was still a significant association between TTR and MPL in both toy/small breeds ($\chi^2$, p<0.0001) and medium to giant breeds ($\chi^2$, p<0.0001). CT revealed a hypoattenuating cortical bony defect in the lateral aspect of the tibial tubercle immediately cranial to the muscular groove. Histopathologic examination showed that this site is a hyaline cartilaginous focus with mild peri-lesional osteoclastic resorption and marrow space edema. The contiguous cortical bone was thin to absent.

Discussion/Conclusion: The results of this study suggest that a TTR is more prevalent in small breeds of dogs and also suggests a possible association between TTR and MPL. Histopathologically, the TTR appears to represent an aberrant focally retained cartilage core within the proximal tibia that may be a manifestation of the tibial conformational changes that predispose to MPL. Although technically abnormal, the radiographic and CT appearance of a TTR should not be confused with malignant pathology.
COMPARISON OF THE ACCURACY, TIMING AND ERGONOMICS OF A WIIMOTE TO A STANDARD COMPUTER MOUSE FOR IMAGE INTERPRETATION.
A.R. zur Linden\textsuperscript{1}, R.T. Stone\textsuperscript{2}, A. Clemens\textsuperscript{2}. College of Veterinary Medicine\textsuperscript{1}, College of Engineering\textsuperscript{2}, Iowa State University, Ames, IA, 50011.

Introduction/Purpose: Digital imaging studies require the use of a computer mouse for image manipulation. Using a mouse for such purposes has been associated with upper extremity disorders including carpal tunnel syndrome. A Nintendo\textsuperscript{©} Wiimote was considered to offer a solution for improved ergonomics and makes a suitable mouse replacement as it can recognize gestures and point through the use of accelerometers. The Wiimote was integrated with the Mac-based imaging software OsiriX using DarwinRemote, and computer code written for efficient integration. The purpose of this study was to compare and evaluate the accuracy and time to interpretation of computed tomography (CT) studies using the Wiimote and a standard mouse. Our hypotheses were that there would be no difference in accuracy of interpretation between the mouse and the Wiimote and that the ergonomics would be improved with the Wiimote.

Methods: Four board certified specialists and five residents in training (radiology, surgery and neurology) participated in this study. Each subject evaluated a randomly assigned set of 10 CT studies (axial volume data) of canine patients with intervertebral disk disease using a mouse and then the Wiimote in a standing position. Subjects determined the location of intervertebral disk extrusion, mineralized intervertebral disks and transitional vertebrae. A maximum of 180 seconds was allowed for each case to introduce a reasonable approximation of time pressure. During the task subjects wore electromyography (EMG) sensors on key muscles associated with wrist movement as well as lower arm rotation and electronic goniometers to measure wrist flexion/extension and radial/ulnar deviation. Prior to the Wiimote session, each subject underwent a 20-minute training session to gain familiarity with the device.

Results: A significant difference (p < 0.05 with a 95% CI) between the mouse and the Wiimote was not identified with respect to accuracy of clinically significant findings (84.4% accuracy by mouse and 81.1% accuracy by Wiimote) for the site of intervertebral disk extrusion and time to interpretation (164 seconds by mouse and 151 seconds by Wiimote). A trend indicated increased deltoid muscle activation when using the Wiimote, but this was not statistically significant. The forearm muscles had significantly increased activation rates and increased flexion/extension of the wrist when subjects were using the mouse, with no significant difference in ulnar/radial deviation.

Discussion/Conclusion: The Wiimote was found to be comparable to the mouse with respect to accuracy of the most clinically relevant findings and time to interpretation. Use of the Wiimote resulted in decreased forearm muscle activation and flexion/extension of the wrist compared to the mouse, with the larger muscles possibly taking over some of the work with the Wiimote. With improved ergonomics, the Wiimote may offer an alternative solution to a mouse for individuals with upper extremity injuries. A future goal is to test a sterilized Wiimote for use in the surgical or interventional suite.
THE SONOGRAPHIC APPEARANCE OF GASTROINTESTINAL LYMPHOMA IN DOGS.
M. Frances, A. Lane, Z. Lenard. Perth Veterinary Specialists, Perth, Western Australia 6017.

Introduction/Purpose: The use of ultrasound for the diagnosis of gastrointestinal neoplasia in dogs is widespread; however, the specific sonographic features of gastrointestinal lymphoma have not been described in isolation in this species. In the cat, sonographic features of lymphoma are well described. In dogs, comparisons have been made between sonographic features of a variety of types of gastrointestinal neoplasia, and enteritis. The purpose of this study is to describe the sonographic appearance of lymphoma of the gastrointestinal tract in 14 dogs.

Methods: A retrospective review was conducted and patients with gastrointestinal lymphoma diagnosed by histopathology (including immunohistochemistry, where available), or cytology that had an abdominal ultrasound were included. Ultrasound images and reports were analysed. Lesions were categorised as structurally normal or abnormal, and were further categorised as being focal, multifocal or diffuse. Wall thickness and layering was assessed, and regional lymphadenopathy was noted.

Results: 14 dogs of a variety of breeds and ages were included. Four dogs had gastric lymphoma; one of these patients had concurrent involvement of the small intestine. Seven dogs had small intestinal lymphoma alone. Two dogs had lymphoma in the large intestine alone (one colon, one rectum). One dog had both small and large intestinal lymphoma. There were 3 B-cell and 3 T-cell variants. Four patients with histopathologically confirmed lymphoma exhibited no sonographic abnormalities. In other dogs with sonographic abnormalities, features including wall thickness and the presence or absence of intestinal wall layering were highly variable. Clinical signs pertaining to the gastrointestinal tract were also unreliable markers of gastrointestinal lymphoma, with weight loss, vomiting, and diarrhoea being uncommon presenting complaints; intestinal obstruction was not present in any patient.

Discussion/Conclusion: The sonographic appearance of gastrointestinal lymphoma in dogs is non-specific and overlaps with that of other neoplastic conditions and enteritis. Gastrointestinal lymphoma in dogs should be considered as a differential diagnosis in the face of sonographically normal appearing bowel.
ULTRASONOGRAPHIC EVALUATION OF THE RELATIVE THICKNESS OF WALL LAYERS IN THE CANINE INTESTINAL TRACT.
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Introduction/Purpose: The normal appearance of the gastrointestinal tract in pediatric and adult dogs has been previously described, including weight-correlated references for total wall thickness. In dogs up to 12 weeks of age, the thickness of individual wall layers for the stomach, duodenum, and jejunum has been reported, however, these values have not been reported in the adult dog or correlated to body weight. The purpose of this study is to establish weight-correlated references for ultrasonographic thickness of the individual wall layers for the duodenum, jejunum, and colon.

Methods: After careful evaluation of the medical record of adult dogs presenting for an abdominal ultrasound, all dogs with a history of gastrointestinal disease in the preceding two months or dogs that had received steroids, non-steroidal anti-inflammatories, antibiotics, or chemotherapeutics within 30 days prior to the abdominal ultrasound were excluded. The remaining dogs were categorized according to weight, including 26 small (<15 kg), 25 medium (15-30 kg), and 34 large (>30 kg) dogs. Electronic calipers were used to measure the mucosal, submucosal, muscularis, and serosal layers as well as the total wall thickness for the duodenum, jejunum, and colon.

Results:

<table>
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<tr>
<th></th>
<th>Mean +/- SD for Duodenal, Jejunal, and Colonic variables</th>
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<tbody>
<tr>
<td></td>
<td>Mucosa (mm)</td>
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<tr>
<td>Small</td>
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<tr>
<td>Duodenum</td>
<td>2.4 +/- 0.5</td>
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<tr>
<td>Jejunum</td>
<td>1.8 +/- 0.4</td>
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<tr>
<td>Colon</td>
<td>0.4 +/- 0.1</td>
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<tr>
<td>Medium</td>
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<tr>
<td>Duodenum</td>
<td>2.6 +/- 0.6</td>
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<tr>
<td>Jejunum</td>
<td>2.0 +/- 0.4</td>
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<td>Colon</td>
<td>0.4 +/- 0.1</td>
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<tr>
<td>Large</td>
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<tr>
<td>Duodenum</td>
<td>2.8 +/- 0.5</td>
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<tr>
<td>Jejunum</td>
<td>2.2 +/- 0.5</td>
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<tr>
<td>Colon</td>
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Discussion/Conclusion: In our opinion, the thickness of individual wall layers may play an important role in characterizing inflammatory conditions in combination with other changes such as wall echogenicity.
ULTRASONOGRAPHIC THICKENING OF THE MUSCULARIS PROPRIA IN FELINE SMALL INTESTINAL T-CELL LYMPHOMA AND INFLAMMATORY BOWEL DISEASE.


Introduction/Purpose: To quantify the full thickness of the intestinal wall of small cell T-cell intestinal lymphoma and inflammatory bowel disease (IBD) compared to healthy cats, and to assess if there is a relationship between the thickness of the muscularis layers of the intestinal wall and the affected segments.

Methods: This prospective study included 8 lymphoma cats, 7 IBD cats and 19 healthy cats. At least 3 images of the duodenum, jejunum and ileum were obtained in orthogonal planes with abdominal ultrasound. All affected cats underwent exploratory laparotomy with full thickness biopsies of the small intestine. Each bowel segment was assessed for the presence of lymphoma with histopathology, immunohistochemistry, and PCR clonality for rearrangement of T-cell receptor gamma. From the ultrasound images, full thickness measurements and thickness of each layer of the intestinal wall were measured in orthogonal planes.

Results: For the duodenum, the widths of the muscularis and the full thickness of the intestinal wall were significantly thicker in cats with IBD or lymphoma than normal cats (muscularis: diff 0.24 mm, p= 0.006 and diff 0.19 mm, p=0.015, respectively; full thickness: diff 0.56 mm, p=0.009 and diff 0.46 mm, p = 0.012, respectively). For the jejunum, both the muscularis (diff 0.25 mm, p = 0.011) and the full wall thickness (diff 0.38 mm, p = 0.023) were thicker in cats with lymphoma versus normal cats, but only the muscularis differed significantly in IBD cats versus healthy cats (diff 0.26 mm, p = 0.046) (Table 1). Healthy cats have a significantly lower muscularis to submucosa ratio than cats with IBD for the duodenum (p=0.005) and jejunum (p=0.023) and for the jejunum in the lymphoma cats (p=0.029).

Discussion/Conclusion: The thickness of the muscularis propria in the duodenum and jejunum were greater in IBD and lymphoma compared to healthy cats. When full thickness was increased, it was due to the increase in the muscularis layer. Muscularis propria thickening is an indicator of IBD and lymphoma, however does not distinguish between the two diseases. A muscularis:submucosa ratio >1 is likely to be associated with IBD or lymphoma.
ULTRASONOGRAPHIC AND CLINICOPATHOLOGICAL FEATURES OF FELINE GASTROINTESTINAL EOSINOPHILIC SCLEROSING FIBROPLASIA.

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Introduction/Purpose: Feline gastrointestinal eosinophilic sclerosing fibroplasia (FGESF) describes a recently classified nodular, non-neoplastic, inflammatory response in cats. Grossly, it commonly appears as an ulcerated mural mass with a necrotic center. Intracellular bacteria are found in 56% of the cats with FGESF. The pathogenesis of feline gastrointestinal eosinophilic sclerosing fibroplasia lesions is unknown. Thus far, there is minimal data that details clinicopathological or diagnostic imaging findings associated with FGESF. The goals of this paper are to report the sonographic and clinical features seen in 4 cats with a confirmed diagnosis of FGESF and to evaluate if any of the features may assist the clinician in including this condition in a differential diagnosis list.

Results: Four cats with histopathologically diagnosed FGESF were included in this retrospective case series. The study population was predominantly adult male cats that presented with gastrointestinal signs. A total of 5 masses were identified in the 4 cats, which included stomach, duodenum, jejunum, and colon (2). FGESF appeared ultrasonographically as a focal mass with loss of layering in all cats. The lesions exhibited mixed echogenicity with hyperechoic regions. Bacteria were identified in 2 cats of this study. Peripheral eosinophilia was noted in 2/4 cats. Neutrophilia (2/4), relative basophilia (2/3) and lymphopenia (3/4), hyperproteinemia (2/3), and hyperglobulinemia (2/4) were also noted. Two cats are still alive at time of abstract submission (40 and 15 months).

Discussion/Conclusion: On ultrasound, FGESF lesions appear as a mass distorting the wall architecture, which is usually supportive of a neoplastic process. Since the ultrasonographic appearance of neoplasia and FGESF overlap, FGESF cannot be diagnosed based on ultrasound alone. The only particular feature that was present in the cats of this series is the presence of hyperechoic areas, likely representing fibrotic regions, which are not commonly seen in neoplasia. We recommend this newly described entity be added to a list of differential diagnoses in cats with focal and inhomogeneous intestinal masses, especially if fine-needle aspirates or biopsies reveal the presence of eosinophilic inflammation, mast cells, and fibroblasts. Surgical biopsy and/or resection of the mass is recommended as FGESF may carry a good prognosis depending on its location.

Introduction/Purpose: Traditionally, the ultrasonographic (US) appearance of the kidney includes a hyperechoic renal cortex and a hypo to anechoic medulla. An alteration in this appearance is often associated with disease processes. It has been our observation that the US appearance of the kidney, specifically the outer medulla can be hyperechoic (HOM) to the renal cortex in normal dogs, especially small and toy breed dogs. The purpose of this study is to describe the appearance of the outer medulla in dogs with no clinical evidence of renal disease. Our null hypothesis was that the renal cortex and outer medulla are isoechoic in all dog breeds.

Methods: Sequential abdominal ultrasound examinations over a 6-month period were reviewed in all dogs without historical or biochemical evidence of renal dysfunction. Exclusion criteria included any dog with any of the following abnormalities: active urine sediment, low urine specific gravity (USG < 1.018), abnormal elevations in BUN, creatinine or serum calcium, diagnosis of portosystemic shunt or US abnormalities associated with the urinary tract. Dogs were subdivided based on weight (6 groups including: <4.9 kg, 5.0 to 9.9 kg, 10 to 19.9 kg, 20 to 29.9 kg, 30 to 39.9 and ≥ 40 kg). Chi square analysis was used to evaluate for significant differences (presence of the HOM) between these groups (p value < 0.05 considered significant). The influence of sex and age in dogs with or without a HOM was evaluated.

Results: Of 145 dogs that met inclusion criteria, 45 had an outer medulla that was hyperechoic relative to the renal cortex. The remainder of the dogs had an outer medulla that was isoechoic to the renal cortex making the two regions indistinguishable on US. Dogs weighing less than 5 kg had a significantly increased probability of having a HOM and dogs greater than 40 kg had no likelihood of having a HOM (p<0.0001). Sex had no influence on the presence or absence of the HOM. The dogs with the HOM were significantly younger (6.4 ± 0.6 yrs) than dogs without the HOM (7.8 ± 0.4 yrs; p = 0.04).

Discussion/Conclusion: Descriptions of the US appearance of the normal canine kidney have not taken into account the relative contribution of the outer medulla. Histologically, the outer medulla contains capillary networks and vascular bundles also found in the cortex, but not the inner medulla. Based on the results of this study, the outer medulla can be isoechoic or hyperechoic to the renal cortex. An HOM is more commonly seen in small breed dogs. This US finding should not be misinterpreted as a medullary rim sign or as pathology.
EFFECT OF SPATIAL COMPOUND IMAGING ON RENAL CORTICAL ANISOTROPY ARTIFACT IN DOGS.
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Introduction/Purpose: Evaluation of the echogenicity of the renal cortex is an important parameter in canine patients that are suspected to have renal dysfunction. Focal increases in echogenicity have been attributed to neoplasia, infection, calcification, fibrosis, gas, and older infarcts. The use of internal reference standards (spleen and liver) requires careful attention to maintaining similar depth, focus, and gain settings as the standard. In addition, the influence of insonation angle and ultrasound machine settings on renal cortical echogenicity must be understood. Anisotropic backscatter has been described as an artifactual source of focally increased renal cortical echogenicity in several species. The source of backscatter appears to be the tubules and medullary rays, which are oriented perpendicular to the renal capsule. Spatial compound imaging (SCI) is an ultrasound machine setting that uses beam steering to acquire and average several overlapping scans of an object from different view angles, creating a compound image that is updated real-time. SCI improves perceived image quality and reduces or eliminates some artifacts. The purpose of this study was to evaluate whether SCI reduces or eliminates renal cortical anisotropy in dogs.

Methods: Eight canine kidneys were evaluated ex vivo in a water bath phantom. Each kidney was examined in two different planes (sagittal and transverse) and two insonation angles using both microconvex and linear transducers. Following image acquisition, two regions of interest (ROI) in each plane were selected for analysis. In the sagittal plane, the cranial pole and the ventral margin were evaluated. In the transverse plane, the ventral and lateral aspects of the cortex were evaluated. Mean pixel intensity of each ROI was measured at 0 and 90-degree insonation angles, using both transducers, and with both conventional and spatial compound imaging modes. Mean pixel intensities for different combinations of ROI, transducer type, insonation angle, and ultrasound mode (SCI or conventional) were compared using multivariable least squares regression with P < 0.05 being significant.

Results: Significant angle-dependent differences in cortical echogenicity were detected with both microconvex and linear transducers in that echogenicity was increased when the insonation angle was oriented perpendicular to the renal tubules. Furthermore, these angle-dependent echogenicity differences persisted even when spatial compound imaging mode was used (P < 0.05).

Discussion/Conclusion: This study demonstrates that there are significant angle-dependent regions of artifactually increased renal cortical echogenicity when ultrasound is performed in sagittal and transverse planes of the normal canine kidney. Furthermore, these regions of increased echogenicity are not significantly reduced when SCI is used. Regardless of machine setting, when focal regions of increased renal cortical echogenicity are detected, the insonation angle should be altered in order to differentiate a true lesion from an artifact caused by anisotropy.
CORRELATION BETWEEN ULTRASONOGRAPHIC PATTERN OF
GALLBLADDER MUCOCELE AND CLINICAL SIGNIFICANCE IN DOGS.
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¹Haemaru Referral Animal Hospital, Seongnam, South Korea 463-050, ²College of
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Daejeon, South Korea 305-764.

Introduction/Purpose: Cholecystectomy is principally recommended as treatment
for dogs with the gallbladder (GB) mucocele. However, cautious medical therapy with
monitoring is applied alternatively because many dogs with GB mucocele are
asymptomatic. GB mucocele can be diagnosed on the basis of typical
ultrasonographic features. At early phase of GB mucocele, the echogenic
inspissated bile occupies the GB, and then stellate or kiwi-like pattern appears with
progress of the disease. This study was performed to investigate the correlation
between ultrasonographic pattern of the GB mucocele and severity of the disease.

Methods: This retrospective study included 43 dogs diagnosed with the GB
mucocele on the basis of inspissated bile on ultrasonography performed from Jan. 1,
2003 to Jan. 31, 2011. The ultrasonographic pattern of GB mucocele was classified
into six types; type 1=immobile echogenic bile, type 2=simple finely striated pattern,
type 3=stellate pattern, type 4=kiwi-like pattern and stellate combination, type 5=kiwi-
like pattern with residual central echogenic bile, and type 6=kiwi-like pattern.

Results: Twenty three dogs including 13 dogs with the GB rupture were
symptomatic. Twenty dogs were asymptomatic. Cholecystectomy (n=25) or medical
therapy (n=17) was applied according to clinical signs and the owner’s request.
Seven dogs were rechecked without surgical intervention or medical therapy for 6
months. The inspissated bile in GB mucocele showed various ultrasonographic
patterns in dogs; type 1=10 (23%), type 2=13 (30%), type 3=5 (12%), type 4=11
(26%), type 5=4 (9%), and type 6=0. There was no significant difference of the
ultrasonographic pattern between symptomatic and asymptomatic dogs. In dogs with
GB rupture, type 2 (8/13) was most common, however this pattern (5/20) was the
second most common finding of GB mucocele in asymptomatic dogs after type 4
(6/20). All dogs (6/43) with loss of GB wall integrity confirmed as GB rupture. In most
dogs with GB rupture, pericholecystic hyperechoic fat (9/14) or peritoneal fluid (9/11)
were observed.

Discussion/Conclusion: There was no significant correlation between
ultrasonographic pattern of the GB mucocele and severity of clinical signs or
incidence of GB rupture. Type 2 was not only common in ruptured cases but also in
asymptomatic dogs. Discontinuity of GB wall was pathognomonic for GB rupture.
Pericholecystic echogenic change and peritoneal fluid were possible evidence of GB
rupture.
POSTER PRESENTATION
ACVR/VCS RECEPTION

Friday, October 19, 2012
6:30 pm - 8:30 pm
MESSINA
STUDENTS’ AND RECENT GRADUATES’ PERCEPTIONS OF RESOURCES FOR LEARNING VETERINARY RADIOLOGY.
K. Alexander, S. Dallaire*, M. Bélisle, N. Fernandez, M. Doucet. Faculté de médecine vétérinaire, Centre d’études et de formation en enseignement supérieur (CEFES), Centre de pédagogie appliquée aux sciences de la santé (CPASS), Université de Montréal and *Léger Marketing, Montreal, Québec, Canada.

Introduction/Purpose: For modern veterinary radiology educators, there are many learning resources that can be used to teach students the principles of radiographic and sonographic technique/interpretation. It is important to promote a diversity of resources that are beneficial to student learning. This study explored students' perceptions of the usefulness of various resources in order to improve/eliminate resources that were deemed unhelpful to learn veterinary radiology.

Methods: Twelve learning resources were studied. Via electronic questionnaires and voluntary participation, novice (n=139) and advanced (n=105) students and recent graduates (n=56) reported the perceived usefulness of each radiology learning resource for course/rotation preparation and practice preparation. Resources were grouped into 4 categories and compared: abstract/low complexity (i.e. notes and multimedia presentations), abstract/high complexity (i.e. web-based and film case repositories), concrete/low complexity (large-group “clicker” workshops) and concrete/high complexity (i.e. small-group techniques and interpretation workshops).

Results: Novice students considered abstract/low complexity radiology learning resources significantly more useful (p = 0.000-0.004) for course/rotation preparation and estimated both categories of concrete resources more useful for practice preparation (p = 0.000-0.005). Advanced students and recent graduates also considered abstract/low complexity resources significantly more useful than most other categories (p = 0.000-0.113) for course/rotation preparation; for practice preparation, no specific category was clearly more useful (p=0.009-0.999) and categories were generally perceived as less useful than for course/rotation preparation (p=0.000-0.355). For all student levels, lecture notes scored high for course/rotation preparation (mean score 8.9-9.3/10) and practice preparation (8.3-8.5/10). Multimedia slideshows (8.5-9.2/10) and small-group interpretation sessions (8.6-9.1/10) scored high for course/rotation preparation. The Web-based case repository (6.4/10) scored low for novice course preparation, and radiology publications (6.1-7.4/10) scored low for advanced students and recent graduates for course/rotation and practice preparation.

Discussion/Conclusion: Traditional abstract/low-complexity resources and particularly lecture notes are a staple of our students' diet; they are considered useful at more levels and in broader contexts than expected. Multimedia slideshow interactivity (i.e. using animation to show radiographic abnormalities) and availability increases their value to complement lecture notes. To improve usefulness, Web-based radiology case-series will be made more accessible and congruent with student level. Concrete/high-complexity learning resources will be modified to better represent everyday general practice in radiology and ultrasound and thus improve their usefulness for practice preparation.
DETERMINATION OF TIME TO MAXIMAL T1 ENHANCEMENT AND EFFECT ON SIGNAL INTENSITY IN T2 WEIGHTED IMAGES OF A HEPATOBILIARY MR CONTRAST AGENT (GADOXETIC ACID) IN HEALTHY DOGS.

Introduction/Purpose: Focal liver nodules are frequently encountered during ultrasound examination of dogs. Definitive diagnosis of benign or malignant nodules requires tissue sampling. Gadoxetic acid, a bolus-injectable liver-specific contrast agent that is taken up by normally functioning hepatocytes, is shown to differentiate benign and malignant nodules in people. The purpose of this study was to determine the time to peak delayed hepatocyte phase enhancement of gadoxetic acid in healthy dogs and to determine the effect of gadoxetic acid on T2 signal intensity in an effort to develop an efficient and clinically applicable hepatic MR imaging protocol.

Methods: Six healthy adult beagle dogs were anesthetized and imaged with a 1.5T GE Signa MR. Contrast enhancement was evaluated using serial transverse T1w (LAVA) and T2w (SSFSE) images obtained immediately pre-and post intravenous injection of 0.1ml/kg gadoxetic acid and every 5 minutes for 45 minutes. Three observers independently evaluated the images. For each series a single slice at the porta hepatis was selected and regions of interest (ROI) were drawn in three locations in the liver avoiding major vessels. A background region of interest was drawn outside the patient to measure noise. Signal to noise ratio ($\frac{SI}{\sqrt{SD_{noise}}}$) and $\Delta$SNR ($\frac{SNR_{post} - SNR_{pre}}{SNR_{pre}}$) were calculated. Effect of time on contrast enhancement of T1w sequences was determined using non-linear curve-fitting software (TableCurve). Maximal contrast enhancement ($\Delta$SNR) and time to maximal enhancement among slice locations, ROI locations, and observers were compared using an analysis of variance. $\Delta$SNR on T2w images pre- and post contrast was compared using an analysis of co-variance.

Results: On T1w images time to maximal enhancement following injection of gadoxetic acid occurred at 10-15 minutes post-injection. Absolute signal intensity varied by location in the liver (p<0.0001), however the time to maximal enhancement was not significantly different among ROI locations (p=0.22), slice locations (p=0.058) or observers (p=0.94). $\Delta$SNR of T2w images was not affected by gadoxetic acid (slope of enhancement curves was not significantly different from zero (p=0.129)). No adverse effects were observed.

Discussion/Conclusion: Peak T1 enhancement occurs at 10-15 minutes post-injection, which is similar to current protocols reported in human patients. The absence of effect of gadoxetic acid on T2w images indicates that these can be acquired during the time between contrast injection and acquisition of delayed interstitial phase images resulting in a clinically applicable hepatic MR imaging protocol for dogs. Further research is required in clinical patients with known focal hepatic lesions.
RADIOGRAPHIC APPEARANCE OF PULMONARY FIBROSIS IN 7 CATS.

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Introduction/Purpose: The diagnosis of pulmonary fibrosis is difficult and requires biopsy for histopathological confirmation. Treatment options are limited and the disease often leads to severe hypoxia, pulmonary hypertension, and right heart failure. Our goal is to describe the thoracic radiographic findings of cats with definitively diagnosed pulmonary fibrosis and to identify which of these, if any, demonstrate type II pneumocyte hyperplasia.

Methods: An email was sent to American College of Veterinary Radiology members to collect cases of feline patients with thoracic radiographs and a histopathological diagnosis of pulmonary fibrosis. Images were reviewed by a board certified veterinary radiologist (JKR) and a diagnostic imaging intern (ME) and graded for type(s) of infiltrates, distribution of disease, and any other abnormal findings of the cardiovascular, pleural, and mediastinal structures. All histopathology samples were reviewed by one veterinary pathology resident (EE) and the severity and distribution of fibrosis were graded, and whether this appeared to be type II pneumocyte hyperplasia or not. When tissue is available, Masson’s trichrome stains will be performed to confirm the presence of collagen.

Results: Seven cases were obtained, ranging from 2 to 15 years of age (mean 10 years; median 7 years). Four were spayed females and 3 were castrated males. Three were domestic short hairs, 2 were Persian, and 1 each of Ragdoll and domestic long hair. Clinical signs included lethargy, exercise intolerance, inappetance, weight loss, coughing, and progressive respiratory distress. Five cats had moderate to severe, diffuse, symmetrically distributed mixed interstitial and bronchial infiltrates; 2 had a military to nodular pattern; 2 had focal soft tissue mass(-es). Two patients had pleural effusion and 2 had cardiomegaly. No lymphadenopathy or other mediastinal abnormalities were recognized. All patients were euthanized due to their respiratory disease. The two patients with mass-type lesions seen radiographically underwent thoracic computed tomography and surgical excisional biopsies; the remainder had post-mortem histopathology.

Discussion/Conclusion: Radiographic appearance of severe, bilaterally symmetrical broncho-interstitial disease and some pulmonary mass(-es) should have pulmonary fibrosis as a differential diagnosis. These cats are often diagnosed as having “feline asthma” but fail to respond to treatment. The disease can progress to right heart failure, to include cardiomegaly and pleural effusion.
CT MORPHOMETRY OF PARASPINAL MUSCLES IN LABRADOR RETRIEVERS WITH VERSUS WITHOUT LUMBOSACRAL PAIN.
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Introduction/Purpose: Labrador Retrievers are the most popular dog breed in the U.S., used for a wide variety of working tasks, and also predisposed to lumbosacral disease (Bergknut & Meij 2010). Lumbosacral pain (LSP) is the most common clinical sign and cause of disability in affected dogs. Human studies have identified decreased CT areas and densities for multifidus, psoas, quadratus, and longissimus muscles in patients with lower back pain and proposed that disuse atrophy of these stabilizing muscles may contribute to recurrence or persistence of lower back pain (Daneels et al, 2000; Kamez et al, 2007, Bouche et al, 2011). The purpose of this study was to describe CT areas and densities of similar muscles in Labrador Retrievers with versus without LSP.

Methods: Medical record and CT databases at the Virginia-Maryland Regional College of Veterinary Medicine and Department of Defense Military Working Dog Veterinary Service were searched for Labrador Retrievers that had CT scans including the lumbosacral region. Computed tomography data were imported into image analysis freeware (Osirix version 4.1.2). A single observer unaware of medical record findings used hand-traced regions of interest to measure transverse CT areas and mean CT densities for multifidus, psoas/iliopsoas, quadratus, and longissimus muscles where visible at L5-6, L6-7, L7-S1, and S1-2 vertebral levels (Smallwood and Thomas, 1982). Vertebral body areas were measured at the same locations as muscle area measurements and used to calculate muscle/body area ratios. After all CT measurements were recorded, medical record data were reviewed and dogs were divided into four groups: working dogs with LSP, working dogs without LSP, companion dogs with LSP, and companion dogs without LSP. Lumbosacral pain was defined as medical record evidence of a painful response to palpation of the lumbosacral region and/or elevation of the tail. Mean CT area ratios and CT densities for each muscle were calculated for each dog group and graphically compared.

Results: Eighteen Labrador Retrievers were included in the study, 12 males and 6 females. Groups consisted of 1 companion dog without LSP, 14 companion dogs with LSP, 2 working dogs without LSP, and 1 working dog with LSP. Mean area ratios were lower for all paraspinal muscles in working and companion dogs with LSP, except for the longissimus lumborum. Mean CT densities were lower for all paraspinal muscles in working dogs with LSP, except for the quadratus lumborum. Mean CT densities were lower for longissimus and quadratus lumborum muscles and higher for psoas/iliopsoas and multifidus muscles in companion dogs with LSP.

Discussion/Conclusion: Most of the findings in our study were similar to those reported in human studies. Higher area ratios for longissimus muscles and higher mean densities for psoas/iliopsoas, quadratus lumborum, and multifidus muscles in dogs with LSP were unexpected and may warrant further investigation.
PRESENCE OF ATLANTOAXIAL LIGAMENTOUS ABNORMALITIES ON MAGNETIC RESONANCE IMAGES IN DOGS WITH AND WITHOUT CHIARI-LIKE MALFORMATION.

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Introduction/Purpose: Chiari-like malformations (CM) in toy breed dogs are associated with multiple craniocervical malformations, including decreased caudal fossa to cranial cavity volume ratio. In people, thickening or mineralization of periodontoid tissue has been identified in patients with clinical Chiari I malformations. Abnormalities of the occipitoatlantoaxial ligaments in toy breed dogs with and without CM and atlantoaxial instability has not been described. No correlations have been made regarding ligamentous abnormalities and clinical signs in dogs with CM. Our purpose was to evaluate the craniocervical junction for the presence of occipitoatlantoaxial ligamentous abnormalities with magnetic resonance imaging (MRI) and to determine their association with CM and clinical signs.

Methods: 104 small and toy breed dogs with MRI of the craniocervical region were divided into CM positive and negative groups based on established criteria. Measurements of the apical, alar and transverse ligament, mid-sagittal cranial and caudal fossae areas, and brain or spinal cord parenchymal changes were analyzed statistically.

Results: 38 dogs were CM positive with a mean age of 6 years and 66 were CM-negative with a mean age of 7.6 years. Maltese, Shi Tzu, Yorkshire and Boston terriers were the most common breeds. Atlantoaxial (AA) luxation was identified in 5 dogs. Twenty-one percent (22/104) of dogs had one or more measurements that could not be performed because of poor visualization or absence of the appropriate sequence. Dorsal spinous ligament length and transverse ligament width were significantly longer in dogs with AA luxations. Significantly more dogs with AA luxations had ligament border irregularities or thickening. Few differences existed between CM and non-CM dogs with ligament changes or clinical signs. CM dogs had a greater degree of AO overlapping compared to non-CM dogs.

Discussion/Conclusion: Ligaments were significantly thicker or longer in dogs with AA luxation. Ligament abnormalities have been described using MRI in dogs, but are not a determining factor in the development of clinical CM. AO overlap is significantly greater in CM dogs, possibly due to instability from malformed or hypoplastic supraoccipital bones. Research with histopathologic correlation is needed.
INFLUENCE OF A DELAYED POST CONTRAST SEQUENCE ON CONTRAST ENHANCEMENT OF INTRACRANIAL LESIONS IN CATS AND DOGS.
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Introduction/Purpose: Acquisition time of post contrast sequences in MRI examinations of the brain is not standardized and reported to be best between 10 and 75 minutes with a possible benefit of a higher detection rate of lesions in late post contrast (p.c.) sequences in people. In veterinary medicine short examination times are requested and the benefit of a delayed p.c. sequence is unknown. Aim of this prospective study was to evaluate whether an additional delayed p.c. sequence influences contrast enhancement of intracranial lesions.

Methods: One hundred and two dogs and 21 cats underwent brain MR imaging with T1 w p.c. sequences immediately after administration of 0.15mmol/kg Gadodiamide and after a time delay of an average of 14 minutes. Both sequences were compared concerning pattern, signal intensity, border definition, extent, and lesion detectability by two board certified radiologist. The total number of lesions, defined by the reference standard including the complete MRI study, radiology report and, in 8 cases histopathological examination, was 87 in 46 animals (36 dogs and 10 cats).

Results: Detection rate was higher in the delayed p.c. sequence (69%) compared to the immediate p.c. sequence (54%); however, detection rate was lower compared to FLAIR (90%). Comparison between both sequences showed increased signal intensity of enhancement over time (p=0.0004). There was no significant difference (p=0.199) concerning pattern, but a change of pattern was seen: one heterogeneous lesion became homogeneous, and ring-like enhancing lesions became either homogenous (1), or heterogeneous (2). Two of four rim-like enhancing lesions became heterogeneous. None of the homogenous enhancing lesions changed pattern. Ill-defined border (p=0.014) and increased lesion extent (p<0.0001) was significantly more often seen in delayed p.c. sequences. Extra-axial lesions (24) did not change border definition in contrast to intra-axial lesions (15), which also showed increase of lesion extent (p<0.0001) in the delayed p.c. sequence. Increase in lesion extent (p=0.0004) was especially seen if perilesional edema was present, and this was also associated with higher signal intensity of enhancement (p=0.0169) and a less well defined border in the delayed p.c. sequence (p=0.025).

Discussion/Conclusion: Contrast enhancement of intracranial lesions is a dynamic process and effects were visible even during the first 15 minutes after administration. Extent, border definition, signal intensity of the enhancement, and in some cases the pattern of the lesions changed, which was especially apparent for intra-axial lesions and in presence of perilesional edema. Since no additional patients with lesions were detected, the benefit of a delayed p.c. sequence as a standard sequence in the examination protocol is questionable.
RADIOGRAPHIC VISIBILITY AND MEASUREMENTS OF CAUDAL LOBAR PULMONARY VESSELS IN HEMODYNAMICALLY NORMAL CATS.
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Introduction/Purpose: Visibility of caudal lobar pulmonary vessels on dorso-ventral projection of the thorax has been reported to be poor in cats on film-screen radiographs. Compared to conventional radiography, digital radiography has been reported to improve image contrast and is now widely available in small animal practice. The aim of this study was to assess the visibility of caudal lobar pulmonary vessels in hemodynamically normal cats with the use of a digital radiography system and report their measurements.

Methods: Normal dorso-ventral radiographs, obtained with a digital radiography system (direct radiography or computed radiography) were retrospectively evaluated by two independent observers (VB, NH). Feline patients included were presented at the Small Animal Teaching Hospital, University of Bristol, with history or clinical signs unrelated to cardio-respiratory disease and they were considered hemodynamically normal based on physical examination, blood analysis results and, when available, echocardiography results. Caudal lobar pulmonary vessels visibility was first assessed on each radiograph by each observer separately. Visibility of vessels (right and left caudal lobar pulmonary arteries and veins) was considered satisfactory when the vessel could be measured at the level of at least one rib, between the 8th and the 12th rib. Inter-observer agreement was evaluated with kappa statistic. Then, both observers established a consensus for vessel visibility and recorded rib pairs at the level of which vessels were best seen. Finally, observers measured diameters of pulmonary vessels and tenth ribs for calculating vessel to rib 10 diameters ratio. Normal reference values are presented as average and standard deviation.

Results: After both observers established a consensus, visibility for right and left caudal lobar pulmonary arteries was 86% and 90% respectively. Right and left caudal lobar pulmonary veins were visualized respectively in 56% and 63% of cases after consensus. Calculated inter-observer agreement was substantial (k=0.79) for arteries and moderate (k=0.5) for veins. Overall visibility of left and right caudal lobar pulmonary arteries and veins was higher at the level of the 10th pair of ribs. Measurements performed at ribs 10 were: 2.93±0.54mm with artery/rib ratio of 1.16±0.26 for caudal lobar pulmonary arteries and 3±0.51mm with vein/rib ratio of 1.15±0.32 for caudal lobar pulmonary veins.

Discussion/Conclusion: Computed and direct digital radiography systems allowed a satisfactory visualization of caudal lobar pulmonary arteries on dorso-ventral projections in a population of hemodynamically normal cats. Caudal lobar pulmonary veins were often not visible. Reference values for vessel diameter and vessel to rib ratio measured at the level of the 10th pair of ribs are proposed in this study. Further measurements of caudal lobar pulmonary vessels in cats affected by cardiac disease and congestive heart failure are necessary for determining statistically significant threshold values.
MAGNETIC RESONANCE IMAGING (MRI) SPINAL CORD AND CANAL MEASUREMENTS IN NORMAL DOGS.
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Introduction/Purpose: Imaging diagnosis of diffuse degenerative spinal cord diseases is difficult. Myelography and computed tomography may demonstrate a smaller cord than is seen in normal dogs. Normal spinal dimensions in dogs as measured on MRI have not been published to date. The goal of this study was to establish MRI reference ranges for spinal cord and spinal canal measurements in normal dogs. The hypothesis was that an increase of spinal cord and spinal canal diameter would be noted with increasing weight, and that the spinal cord-to-spinal canal ratio would remain constant between different weight groups.

Methods: Following an initial preliminary investigation in a cadaver, 40 dogs were enrolled in the study. Dogs were grouped according to weight (1-10 kg, 11-20 kg, 21-30 kg, >30 kg; 10 dogs per category). Spinal MRI (1.0T Siemens Magnetom Harmony) was performed on all dogs. Spinal measurements were performed on sagittal T2-w images at the level of T4, T9 and L3. Data are presented as mean (+/− SD) for normally distributed data and median (interquartile range) for non normally distributed data. One Way ANOVA or Kruskal-Wallis ANOVA on Ranks were used for comparison between groups. A p-value of <0.05 was considered significant.

Results: Mean/median spinal canal diameter (mm) ranged from 6.07 ± 0.63 (1-10kg) to 8.27 ± 1.15 (>30kg) at the level of T4; 6.55 ± 0.61 (1-10kg) to 9.04 ± 1.26 (>30kg) at the level at T9; and 6.80 (6.47–7.00; 1-10kg) to 9.00 (7.90–9.73; >30kg) at the level of L3. There were significant differences in spinal canal measurements between groups (p<0.05). Mean spinal cord diameter (mm) ranged from 4.46 ± 0.51(11-20kg) to 4.70 ± 0.35 (1-10kg) at the level of T4; 4.41 ± 0.50 (>30kg) to 4.85 ± 0.57 (1-10kg) at the level of T9; and 4.52 ± 0.51 (>30kg) to 5.14 ± 0.68 (1-10kg). There were no significant differences in spinal cord measurements between groups. Spinal cord-to-spinal canal ratio varied significantly between different weight groups, ranging from 0.51 ± 0.08 (>30kg at L3) to 0.78 (0.69 – 0.80; 1-10kg at T4) (p<0.05).

Discussion/Conclusion: While a significant increase in spinal canal diameter was noted with increasing weight as hypothesized, no significant differences were noted in spinal cord diameter between weight groups. The spinal cord-to-spinal canal ratio was significantly smaller in larger dogs. These findings are important when using MRI to evaluate patients with suspected degenerative spinal cord disease.
COMPUTED TOMOGRAPHIC ANATOMY OF THE THORAX OF THE LIVE COMMON BOTTLENOSE DOLPHIN.
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Introduction/Purpose: Pulmonary disease is a leading cause of morbidity and mortality in cetaceans, frequently affecting animals in the wild and under human care. The purpose of this study was to present the normal computed tomographic appearance of the thorax of the live common bottlenose dolphin (Tursiops truncatus) and to describe the technical parameters and logistics involved in CT image acquisition in this species.

Methods: Six normal thoracic CT evaluations of four adult dolphins were performed between April 2007 and May 2012. Following voluntary beaching, animals were transported from open ocean pens to the CT facility on protective foam pads in covered trucks. Under light sedation, animals were secured in ventral recumbency for acquisition of CT data using a GE Lightspeed® RT 16 helical CT (80cm gantry, 227kg limit). Equipment was protected with plastic sheeting and water judiciously applied to the animals’ skin. Non-contrast helical images were obtained during a normal prolonged end-inspiratory breath hold using contiguous 1.25mm slices, a pitch of 1.75, 140 kVp, and auto mA (300-175).

Results: Diagnostic, high quality images were obtained in all cases. Respiratory motion was insignificant in these conscious animals due to their normal apneustic respiratory pattern. Unique anatomical considerations included the presence of a right accessory bronchus, thick airways due to cartilaginous reinforcement of terminal bronchioles, broad aortic bulb, dorsoventrally compressed heart, marginal lymph nodes, and notably oblique diaphragm.

Discussion/Conclusion: Thoracic CT in live dolphins is both feasible and clinically valuable. A series of normal reference images is presented.
MODEL SYSTEMS FOR INVESTIGATION OF TREATMENT OPTIONS FOR FELINE INJECTION SITE SARCOMA.
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Introduction/Purpose: Feline injection-site sarcomas (FISS) have a high recurrence rate of up to 45\% even after wide surgical excision. Alternative treatment modalities are therefore urgently needed. Evaluation of new therapies requires appropriate in vitro systems as well as suitable small animal models. The aim of this study was to establish a relevant cell culture model allowing evaluation of a combined doxorubicin-based chemo/radiation therapy in vitro.

Methods: Tissue taken from excised tumour samples was digested in PBS containing 2 mg/ml collagenase. Cells were cultivated and passed in DMEM with 10\% foetal calf serum (FCS). For further characterisation, 5\times10^6 cells were injected subcutaneously into Hsd:Athymic Nude-Foxn1\textsuperscript{tm} mice and tumour growth monitored. For treatment, 5\times10^4 cells per well of a six-well plate were seeded and 2 days later either exposed to 0.25 \mu mol doxorubicin for 8 hours and/or irradiated with 3.5 Gray (Gy) or kept untreated. In a second treatment regimen irradiation was performed 20 hours after removal of doxorubicin. At Day 7 after beginning of the treatment the number of surviving cells was determined.

Results: Three cell lines (FFS1, FFS2 and FFS2ST) were successfully established from tumour tissue of two different injections-site sarcomas. The cell line FFS1rec was established from FFS1 cells grown in mice. In vitro treatment of cells with doxorubicin and/or radiation revealed a reduction in cell numbers after seven days. FFS1 and FFS2ST were shown to be highly sensitive towards doxorubicin treatment alone (21\% and 32\% surviving cells, respectively); additional irradiation caused a significant further decrease of cell counts (9\% and 19\% surviving cells). For FFS1rec and FFS2 cells efficacy of doxorubicin treatment was shown to be similar to that achieved with radiation therapy (46\% to 62\% surviving cells). Interestingly, doxorubicin treatment followed by irradiation of cells 20 hours later increased the killing effect significantly, thereby reducing the surviving cell fraction to 21 and 25\%.

The obtained cell lines were injected subcutaneously into immune-deficient mice where they caused tumour formation. FFS1-derived tumours were continuously passaged in mice for forty times. Excised mouse-grown tumours were subjected to histopathological analysis and still diagnosed as a fibrosarcoma.

Discussion/Conclusion: The established cell lines were shown to be a valuable tool facilitating evaluation of new FISS-specific therapies. The presented results indicate a significant benefit of a doxorubicin-based chemo/radiation combination therapy. The correspondent tumour mouse model will allow controlled in vivo investigations, avoiding the use of feline patients which, due to differences in tumour grade, previous treatments or intensity of care, represent a quite variable model.
Medical Infrared Imaging (Thermography) in Cats With Hyperthyroidism.

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Introduction/Purpose: Medical infrared imaging (MII) is an imaging technique that measures skin surface temperature derived from cutaneous perfusion and generates thermal pattern maps based on color scales. Recent advances in computer technology have enhanced the utility MII in a variety of medical applications in both human and veterinary medicine. Hyperthyroidism is the most common endocrine disorder of cats. In cats exhibiting clinical signs of hyperthyroidism, an elevated serum T4 value is considered diagnostic for hyperthyroidism. Cats with “occult” hyperthyroidism or sick-euthyroid syndrome may both have serum T4 values within the normal reference range. Additional diagnostics may be required to identify early hyperthyroidism and sick euthyroid cats including free T4, serial total T4, T3 suppression test and nuclear scintigraphy. Nuclear scintigraphy is not readily available and can be found at select specialty referral hospitals. The purpose of this study is to: 1) determine the success of MII in identifying cats with hyperthyroidism 2) determine if the MII pattern was affected by haircoat.

Methods: 20 cats with clinical signs related to hyperthyroidism and T4 levels greater than 4.0 ug/dl and 24 “control” cats with no evidence of hyperthyroidism and T4 levels between 0.8-4.0 ug/dl were included in this study. Complete physical examination, complete blood count and serum biochemical profile, MII of the thyroid region before and after clipping were performed. Computer recognition pattern analysis software was utilized to differentiate between thermographic patterns in hyperthyroid and normal cats.

Results: Computer recognition pattern analysis was able to differentiate normal cats from hyperthyroid cats both before and after shaving the thyroid region. The best MII results (92.1%) were achieved using the NormGrey images in the unshaved group while the best results (86.5%) were achieved using the NormGrey images in the shaved group.

Discussion/Conclusion: MII has been used as a test for a variety of conditions in veterinary medicine that cause autonomic dysregulation resulting in altered cutaneous perfusion including cranial cruciate rupture, intervertebral disk disease, and chiari like malformation. Difficulty handling cats with hyperthyroidism while performing sedation or blood sampling can be difficult owing to the fractious nature of these patients. Clipping of the hair coat and sedation were not necessary to create useful MII studies in the cats included in this study. MII was successful in identifying cats with hyperthyroidism and may be used as a screening test for cats suspected of having hyperthyroidism.
EFFECT OF UPPER AIRWAY OBSTRUCTION ON THORACIC WALL CONFORMATION IDENTIFIED ON ROUTINE THORACIC RADIOGRAPHS.

Introduction/Purpose: Chronic upper airway obstruction leads to increased work of breathing. Ultimately this results in increased negative intrathoracic pressure during inspiration, causing the caudal ribcage to collapse inward with each inspiratory effort, reducing, rather than increasing the volume of the thorax.

Over time, it is hypothesized that this chronic paradoxical breathing pattern, leads to changes in respiratory mechanics, resulting in anatomic changes to the caudal thoracic wall and sternum that can be seen on routine thoracic radiographs in many canine patients with upper airway disease. These changes include dorsal deviation of the xiphoid (pectus excavatum), cranial displacement of the diaphragm during inspiration (hypoinflation), and craniodorsal displacement of the caudal costochondral junctions, causing a “wave” appearance to the costal arch on lateral projections of the thorax.

Methods: A retrospective study of caudal thoracic confirmation was conducted on left lateral thoracic radiographs of brachycephalic dogs seen in hospital from 2007-2011 with (n=74) and without (n=122) a clinical diagnosis of upper airway obstruction (n=196 image sets).

In all radiographic image sets, the left lateral thoracic radiograph was evaluated for the above described changes. Three measurements and ratios were performed on the images in an attempt to objectify the subjectively abnormal appearance of the caudal thoracic wall. Dogs with thoracic wall changes were coded as 1, dogs without changes were coded as 0. Similar coding was done for each dog regarding clinical diagnosis of upper airway obstruction.

Results: The logistic regression model found that thoracic wall changes were predictive of upper airway obstruction. Animals with thoracic wall changes were 1.5 times (OR: 1.5, 95% CI: 1.2-2.1) more likely to be diagnosed with upper airway obstruction. Breed, sex, age, or weight was not found to be significant (p=0.4).

Discussion/Conclusion: Brachycephalic dogs with upper airway obstruction are more likely to have caudal thoracic wall and xiphoid conformational changes, regardless of breed. Identifying these changes on routine thoracic radiographs should indicate to the clinician to closely evaluate the upper airways.
COMPARISON OF RADIOGRAPHIC AND COMPUTED TOMOGRAPHIC MEASUREMENTS OF TRACHEAL DIAMETER AND LENGTH IN DOGS.


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Introduction/Purpose: Tracheal collapse is a common progressive disease affecting predominately small and toy breed dogs. Currently radiography, bronchoscopy and fluoroscopy are the imaging techniques used for diagnosing and monitoring this condition. Tracheal stent placement is a palliative procedure for the management of tracheal collapse when medical management is no longer effective. Accurate measurement of tracheal luminal diameter is essential for selection of stent size. In veterinary medicine, radiography is the most readily available and most commonly used imaging modality for measuring tracheal diameter, but in humans, computed tomography (CT) is the imaging modality of choice. The purpose of this study is to compare tracheal lumen diameter and length measurements obtained via radiographs and CT. In addition, we compared radiographic measurements obtained in multiple degrees of obliquity to determine the most accurate patient position for radiographic tracheal measurements as compared to CT.

Methods: Fifteen cadavers, euthanized for reasons not related to tracheal disease, were imaged with CT and digital radiography within two hours of euthanasia. All cadavers weighed ≤ 20 kg. All cadavers were manually ventilated to 20 cm H2O during imaging. CTs were performed in dorsal recumbency with the ventral mandible at a 45˚ angle to the table. Radiographs were acquired in lateral, 15˚ oblique, and 45˚ oblique recumbency. For each observer, the mean of three independent measurements was determined at each of five locations on the trachea, as well as a mean of three independent measurements of tracheal length. Separate mixed linear regression models were constructed and the least-squares mean and standard error was reported for each observer. Statistical significance was defined as P < 0.05.

Results: The mean difference for all observers shows the CT measurement of tracheal diameter was larger than the radiographic measurement by 1.03 mm with a 95% confidence interval of 0.83 mm to 1.23 mm (P < 0.001). With the exception of one observer for the 45˚ oblique, this difference was also statistically significant for each observer individually. No statistical difference was found when comparing the different radiographic projections to each other. The tracheal lengths measured on radiographs and CT did not differ statistically.

Discussion/Conclusion: Radiographic measurements of tracheal diameter were less than measurements acquired in CT images for all observers. This has potential clinical significance, as accurate measurements are essential in selecting the appropriate tracheal stent size to minimize complications associated with this procedure. The clinical outcome of undersized and oversized stents could be evaluated further.
REDUCTION IN DOSE OF SCATTER RADIATION USING PROTECTIVE LEAD SHIELDING ON DOGS RECEIVING ELBOW RADIOGRAPHS.

Introduction/Purpose: In humans, protective lead shielding is routinely used to reduce the dose of scatter radiation received to the patient during routine radiography. A similar practice is not routinely used in veterinary patients. Our goal was to measure the dose of radiation received by dogs during routine elbow radiographs, and to measure the reduction in scatter radiation that results by using personal protective lead shielding.

Methods: 8 Newfoundland puppies received bilateral elbow radiographs. Seven dosimetry badges (1 mrem sensitivity, Mirion Technologies Type 36 TLD) were used per puppy. They were placed 1) in the primary beam; 2) over the lead at the level of the eyes 3) cranial abdomen and 4) gonads; 5) under the lead at the level of the eyes 6) cranial abdomen and 7) gonads. We used 0.5mm equivalent lead gowns and thyroid shields to cover the bodies and eyes, respectively. Dosimetry badges were processed by standard methods with a control badge.

Results: All badges in the primary beam detected radiation (average 34 mrem). Less radiation was detected over the protective shielding, and a significantly decreased amount of radiation was detected under the protective shielding (Figure 1).

Discussion/Conclusion: Protective shielding significantly reduces the dose of scatter radiation to canine patients. Protective lead shielding is advised in veterinary patients.
ASSESSMENT OF RESPIRATION INDUCED DISPLACEMENT OF CANINE ABDOMINAL STRUCTURES IN DORSAL VERSUS VENTRAL RECUMBENCY USING COMPUTED TOMOGRAPHIC IMAGING.
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Introduction/Purpose: Respiration-related movement is an important source of displacement in abdominal structures and the patient’s positioning could alter the degree of organ displacement, influencing quality of diagnostic computed tomographic (CT) studies and accuracy of dose delivery in radiotherapy. The goal of this study was to quantify displacement of abdominal structures in dorsal recumbency (DR) versus ventral recumbency (VR) in normal dogs using CT.

Methods: Transverse images of the abdomen of three normal beagles were acquired in DR and VR in a caudal to cranial direction using a 64 multidetector CT unit. For each position, an initial apnea exam was obtained followed by a 4D CT exam during free breathing acquiring images at each couch position over a full breathing cycle resulting in 20 data sets for each recumbency. Using a dedicated workstation these image sets were fused to the baseline apnea study on which the liver, skin, spine, pancreas, kidneys, medial iliac lymph nodes and urinary bladder were contoured. The differences between the structure positions were measured in cranial to caudal (CC), dorsal to ventral (DV) and right to left (RL) directions. A Wilcoxon signed rank test was used to compare structure displacement between DR and VR; p < 0.05 was considered statistically significant.

Results: Overall structure displacements < 1cm in all directions were detected in both DR and VR, except for liver (max 3.72 cm) and pancreas (max 1.33 cm). The liver was displaced more frequently and to a higher degree compared to all other structures and the DR showed significantly less displacement in the DV direction compared to VR. A significant difference was also found for displacement between DR and VR for spine in DV and RL directions, left kidney in DV, CC and RL directions, pancreas in DV and RL directions, skin in DV and RL directions and urinary bladder in RL directions. For these structures, the position with least displacement varied among directions, with the exception of the urinary bladder for which VR had less displacement in RL direction and no displacement was found in the other directions for both DR and VR. There was no displacement in either direction for both DR and VR for the right sublumbar and only minimal (0.2 cm) for the left sublumbar lymph node in the DV direction in VR.

Discussion/Conclusion: With exception of liver and pancreas, overall displacement of canine abdominal structures was minimal for both DR and VR positions. For liver, the DR provided least displacement while for urinary bladder the VR showed least displacement which may be important both for diagnostic and radiotherapy purposes. In the remaining structures, the large variability or complete absence of displacement among the different directions precludes the choice of one position over the other.
CT MEASUREMENT OF THE INCLINATION ANGLES AND MOTION OF THE SACROILIAC JOINT IN GERMAN SHEPHERD DOGS AND GREYHOUNDS.


Introduction/Purpose: The sacroiliac joint (SIJ) has been implicated as a cause of back pain in people and horses. Breed differences in the SIJ, such as sagittal alignment, rigidity, and range of motion, may alter loading of other structures, and predispose to pain, but the SIJ has not been accurately measured in vivo in the dog. The purpose of this study was to measure the in vivo motion and inclination angles of the SIJ in two breeds using computed tomography (CT). We selected two performance breeds of which only one, the German Shepherd dog (GSD), is predisposed to caudal back pain.

Methods: CT scans were performed in flexed, extended, and neutral positions, on 9 working police GSDs and 10 racing greyhounds (GHs) without caudal back pain or neurological abnormalities. Rotational and translational motions of the ilia relative to the sacrum were quantified. Inclination angles of the synovial and fibrocartilage components of the SIJs were measured. The effects of breed, and other parameters were analysed using a general linear model. A minimal adequate model was obtained by the process of backwards selection.

Results: CT measurements were precise, with a coefficient of variation (CV) for all measurements of <10%. GSDs had less rotational motion at the SIJ than GHs (-1.97±1.54° vs. -1.53±0.69°, p<0.01), and less translational motion in the craniocaudal direction than GHs (0.95mm±0.72mm vs. 1.44mm±0.66mm, p<0.05), but there was no statistical difference between GSDs and GHs in the degree of dorsoventral translation, which was 0.66mm±0.45mm for both breeds combined. The inclination angle of the cranial synovial joint component was 5.5° larger, as measured from the dorsal plane, in the GSDs than in the GHs (p<0.01). There was no statistical difference between breeds in the inclination angle of the synovial component at the caudal location, or in the inclination angles of the cranial, and caudal fibrocartilage components. There were no differences between sexes or between left and right limbs for any measurement in either breed.

Discussion/Conclusion: GSDs have more rigid SIJs relative to GHs as seen by decreased rotational and craniocaudal translational range of motion. This may increase loading of the SIJ which could lead to joint degeneration directly or may transfer those forces to other structures. The cranial synovial component of the SIJ in GSDs was aligned closer to the sagittal plane than in GHs. A more sagittal joint alignment may increase loading forces on the soft tissues surrounding the joint. Future studies are planned to determine if these differences are associated with caudal back pain in GSDs.
FEASIBILITY FOR USING DUAL-PHASE CONTRAST-ENHANCED MULTI-DETECTOR HELICAL CT TO EVALUATE AWAKE AND SEDATED DOGS WITH ACUTE ABDOMINAL SIGNS.
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Introduction/Purpose: Canine patients with acute abdominal signs are often clinically unstable and therefore need both a rapid and accurate diagnosis. Contrast-enhanced multi-detector computed tomography (CE-MDCT) is the current modality of choice for evaluating acute abdominal pain in people. Advantages of MDCT include relative rapidity of image acquisition and high spatial resolution. We hypothesized that dual-phase CE-MDCT would be feasible and safe for use in both awake and minimally sedated canine patients with acute abdominal signs.

Methods: Eighteen client-owned dogs were enrolled; all presenting with acute abdominal signs. Dogs were scanned using an equivalent dual phase CE-MDCT protocol that included pre-contrast, arterial and portal venous phases. An optional delayed scan was added to the protocol for some dogs to document renal excretion of intravenous contrast material. Overall scan time was recorded. Eight dogs were scanned awake and 10 were given light sedation as chosen by the primary care clinician. Two observers who were unaware of clinical findings and sedation status scored image quality for each scan by consensus opinion.

Results: Median scan time for all patients was less than 10 minutes. Sixteen of 18 CE-MDCT scans were scored fair to excellent in diagnostic quality with no statistical difference in diagnostic quality for awake versus sedated patients (p<0.05). Causes for 2 poor quality diagnostic scans included severe beam hardening from previously administered barium contrast agent and severe motion artifacts. No intravenous contrast-related adverse reactions were seen.

Discussion/Conclusion: Dual-phase CE-MDCT is both feasible and safe for use in awake or minimally sedated dogs with acute abdominal signs. Our protocol may be performed rapidly and with excellent diagnostic results. Image quality was sufficient to permit the creation of maximum intensity projection and 3D volume rendering reconstructions resolving sub-millimeter mesenteric arteries for multiple awake and sedated dogs in our study. Limitations of our study included small sample size, unequal group numbers, and non-randomized group assignments. A controlled clinical study comparing this protocol with current standard imaging techniques has been performed by our group to determine whether dual-phase MDCT should be the screening modality of choice for dogs with acute abdominal disease.
THREE CASES OF ENLARGED UTERUS MASCULINUS DIAGNOSED VIA ULTRASOUND.
Purdue University, College of Veterinary Medicine, Department of Veterinary Clinical Sciences, IN 47907.

Introduction/Purpose: The uterus masculinus or prostatic uricle is a vestigial embryological remnant of the Mullerian duct in males. In a normal adult, it normally persists as a small diverticulum in the dorsal aspect of the prostatic urethra in the vicinity of the seminal colliculus. Enlargement of this structure can occur due to failed involution during fetal development and has been associated with various clinical manifestations in humans and dogs, most commonly dysuria, UTI and incontinence. Previous reports in the veterinary literature have identified cystic uterus masculinus via radiography and contrast cystography. This paper describes three case studies where enlargement was diagnosed via ultrasonography, including one case with confirmed metastatic infiltration of the structure due to multicentric intestinal lymphoma.

Methods: Three male dogs aged 8-11 years were diagnosed with enlarged uterus masculinus via ultrasonography within the period of 2009-2011. In all three cases digital images and/or real time recordings of the structure were available for review.

Results: Patient 1 presented for chronic vomiting, diarrhea and weight loss with evidence of protein losing enteropathy, sepsis and multiple organ pathology. Abdominal ultrasound detected two hypoechoic tubular structures extending cranially and dorsally from the prostate. Hypoechoic nodules within multiple organs, corrugation of intestinal loops and abdominal effusion were also noted. Necropsy confirmed multicentric lymphoma, where the hypoechoic tubular structures were consistent with uterus masculinus infiltrated with neoplastic cells. Patient 2 presented for chronic UTI and incontinence. Feminization of the external genitalia and absence of os penis was noted on physical exam. Ultrasound revealed prostatomegaly and a hypoechoic tubular structure extending cranially and dorsally from the prostate to the level of the urinary bladder. Aspirate of the prostate was consistent with infectious prostatitis. Patient 3 presented with multiple problems including electrolyte abnormalities, anemia, anorexia, lethargy, and dysuria associated with UTI. Ultrasound revealed a hypoechoic tubular structure approximately 3 mm in diameter extending cranially and dorsally from the prostate to the level of the urinary bladder.

Discussion/Conclusion: Persistent enlarged uterus masculinus has been relatively well studied in humans, but published cases are rare in veterinary medicine. Ultrasonographic appearance of the uterus masculinus has not been previously described in dogs, and neoplastic infiltration of this structure has not been reported. These cases do not show extensive cystic enlargement as described in previous studies. Patient 2 was presented with feminization of external genitalia, which is usually reported in association with cystic uterus masculinus in humans. Concomitant urinary tract infection was present in all three patients. This condition can likely be diagnosed in most cases via abdominal ultrasound, and appears as a single or paired tubular, hypoechoic structure(s) that originates from the prostate and extends cranially into the abdominal cavity.
VOLUMETRIC ESTIMATION OF THE PROSTATE GLAND USING COMPUTED TOMOGRAPHY IN NORMAL BEAGLE DOGS.

D.W. Chang, Y.W. Lee, H.J. Choi. College of Veterinary Medicine, Chungnam National University, Daejeon, South Korea 305-764; 1College of Veterinary Medicine, Gyeongsang National University, Jinju, South Korea 660-701; 2College of Veterinary Medicine, Chungbuk National University, Cheonju, South Korea 361-763.

Introduction/Purpose: Estimation of the canine prostate gland size is useful for the clinical evaluation of prostatic disorders in dogs. The purpose of this study was to compare ultrasound and computed tomography for evaluation of prostate gland size.

Methods: The prostate gland was evaluated using ultrasound and computed tomography in eight healthy beagle dogs. Prostate length (L) and depth (DL) were measured in sagittal ultrasonographic images, and width (W) and depth (DT) in transverse images. Prostatic volume was calculated using following two types of formula previously reported; US1 = 1/ 2.6 (L × W × DL) + 1.8 and US2 = 0.487 × L × W × [(DL + DT)/2] + 6.38. Prostatic height (H), length (L) and width were measured on CT images. In addition, ratios of prostatic height (rH), length (rL), and width (rW) to the length of the 6th lumbar vertebral body were calculated. Prostatic area was determined as hand drawn regions of interest, and volume was calculated using the volume rendering software.

Results: Prostatic volume was 10.35 ± 2.81, 16.11 ± 5.83, and 18.56 ± 7.72 ml by US1, US2, and CT method, respectively. The US1 method was significantly underestimated the prostatic volume compared with the CT method (p = 0.029). Significant positive correlations were found between prostatic volume and prostatic dimensions [length (r² = 0.69) and width (r² = 0.80)] by CT method. Ratios of prostatic dimensions to the length of the 6th lumbar vertebra were rH 1.07 ± 0.29, rL 1.01 ± 0.11, and rW 1.57 ± 0.20.

Discussion/Conclusion: The volume calculation of prostate gland obtained with ultrasonography (US2) and computed tomography could be useful for estimation of prostatic size. Prostatic length and width correlated better than height with prostatic volume. The ratio of prostatic dimensions to the 6th lumbar vertebral length could be a simple quantitative index for evaluation of prostatic size.
Introduction/Purpose: The appearance of visceral and parietal abdominal lymph nodes on computed tomography (CT) studies has been described in general terms previously, however the specific frequency of identification, size, shape, and possible variation in attenuation characteristics and contrast enhancement are absent in current literature to the authors’ knowledge. The aim of this study is to determine the relative frequency of identification and CT characteristics of presumptively normal lymph nodes of dogs undergoing CT of the abdomen.

Methods: The medical records of the Veterinary Medical Teaching Hospital of the University of Wisconsin-Madison were retrospectively reviewed for all dogs undergoing computed tomographic imaging of the abdomen between 2007 and 2012. Patients with presenting signs and/or recent clinical history of neoplasia, gastrointestinal disease, peritoneal effusion, or other conditions considered likely to affect abdominal lymph nodes were excluded. Twenty dogs met the inclusion criteria and their post contrast CT examinations were reviewed. For each dog the age, gender, breed, body weight in kg, and recumbency were recorded. Visceral and parietal lymph nodes of the abdomen were identified, assigned to one of eleven lymphocenter groups, their dimensions measured, and shape and contrast enhancement subjectively characterized as either regular or irregular and as homogeneous or inhomogeneous, respectively, by a radiology resident (J.E.S.) individually and a consensus was made with a board certified radiologist (R.D.). Dimensions were measured using electronic calipers for height and width. Length was estimated using the number of slices in which a single node was identified multiplied by the slice thickness.

Results: A total of 222 lymph nodes in 20 dogs were identified. Medial iliac and mesenteric/jejunal lymph nodes were identified in 100% of the dogs, hepatic in 95%, hypogastric in 85%, splenic in 80%, pancreaticoduodenal and colic/ileoceleal in 60% each, aortic/lumbar in 50%, sacral in 45%, and gastric in 20%. Renal lymph nodes were not identified. All lymph nodes (100%) were categorized as having a regular shape and exhibiting homogeneous contrast enhancement. Lymph nodes of all groups were either round or elongated with dimensions ranging from 0.14 cm up to 6.5 cm, with sacral and hypogastric nodes measuring the smallest, and mesenteric/jejunal, colic/ileoceleal, and hepatic nodes measuring the largest.

Discussion/Conclusion: Presumptively normal visceral and parietal lymph nodes of the canine abdomen are readily identified during CT examination however there is marked variation in the conspicuity and size of the nodes of different lymphocenter groups.
IMAGING FINDINGS IN DOMESTIC FERRETS (*Mustela putorius furo*) WITH LYMPHOMA.


Introduction/Purpose: Lymphoma is the most common malignant neoplasia in domestic ferrets, *Mustela putorius furo*, and overall the third most common neoplasia in ferrets. Imaging findings in ferrets with lymphoma have not been described outside of a few single case reports. Imaging findings in 13 ferrets with confirmed lymphoma are described.

Methods: Ferrets with a confirmed diagnosis of lymphoma and diagnostic imaging between 2002 and April 2012 were included. Signalment, clinical signs, concurrent disease, clinicopathologic and histopathologic findings, and method of diagnosis were recorded. Radiographs (*n* = 11), ultrasound (13), CT (1), and MRI (1) images were evaluated. Because splenomegaly is a common finding of ferrets, most frequently due to extramedullary hematopoiesis, when present splenomegaly was subjectively graded as within incidental variation and larger than expected for “incidental splenomegaly.”

Results: Thirteen ferrets were included, with a median age at the time of diagnosis of 5 years (range 3.25 to 7.6 years). Clinical signs were generally nonspecific (*n* = 7), aside from 3/13 ferrets with T3-L3 myelopathy, 1/13 with lameness, and 2/13 with no overt signs. The time between the first imaging study and the confirmed lymphoma diagnosis was 1 day or less in most ferrets (11) and in one ferret each, 7 days and 6.9 months. Abnormalities were predominantly detected in the abdomen and sonographically included: splenomegaly (12) with nodules (6) or a splenic mass (1); peritoneal effusion (10); lymphadenopathy (10); hepatomegaly (2) with a cystic hepatic mass (1); and renal masses (2). On radiographs poor serosal detail (9) with mottling (6); splenomegaly (9); lymphadenopathy (7); and hepatomegaly (5) were detected. Splenomegaly was present in all ferrets with lymphadenopathy. Overall, splenomegaly was considered within incidental variation with ultrasound in 4/12 and in 2/9 on radiographs. Lymphoma was confirmed in 3/6 ferrets with splenic nodules and 1/1 splenic mass, but was not identified in 3/4 spleens with a normal echotexture and “incidental splenomegaly” sonographically. Cytology or histopathology were not performed on the other spleens (5/12). One ferret had mild anechoic peritoneal effusion and no other detected abnormalities; lymphoma was identified postmortem in the descending colon of this ferret without gross wall thickening. Pleural and pericardial effusions were present in one ferret. Vertebral lysis and extensive femoral lysis were seen in ferrets with T3-L3 myelopathy (2/3) and lameness (1/1), respectively. On CT in one ferret with myelopathy, hyperattenuating, enhancing masses with secondary cord compression were associated with vertebral lysis. This ferret also had a heterogeneous, aggressive rib mass and abdominal and thoracic lymphadenopathy. MRI performed in the one ferret with myelopathy without vertebral lysis was inconclusive; however, only T2w and STIR series were obtained. At necropsy lymphoma was identified in the brain and spinal cord.

Discussion/Conclusion: Abnormalities were predominantly noted in the abdomen and most frequently included lymphadenopathy and splenomegaly (subjectively greater than expected for “incidental splenomegaly”). Ferrets with myelopathy or lameness may have radiographically detectable osteolysis. Few ferrets had inconclusive imaging findings.
THORACIC DIGITAL RADIOGRAPHY: EVALUATION OF IMAGE QUALITY USING A CDRAD PHANTOM.

Introduction/Purpose: Veterinarians have embraced computed and digital radiography as a method to more easily obtain diagnostic quality radiographs of patients. However, a basic understanding of quality control of digital images is largely deficient in adoptees of this technology in general veterinary practice. Additionally, there is even debate about appropriateness of grid use among radiologists. The goal of this project was to use a contrast detail phantom to quantitatively evaluate digital radiography image quality using a thoracic radiography phantom. Additional data was obtained for entrance skin and scatter radiation dose, 1 cm from the patient.

Methods: With thoracic radiology phantom in place, ten radiographs were acquired on a digital radiography system to estimate the average entrance detector dose using the hospital’s current technique chart (17 cm thick, 109 kVp, 2.5 mAs, 40” FFD). This entrance detector dose average was standardized using variable kVp (60, 79, 100, 117) and presence of a grid, by manipulation of the mAs. In addition, the above kVp and grid variables were repeated, with a fixed mAs (2.5). For each exposure, entrance detector, entrance skin and scatter radiation dose, at 1 cm from the patient, was recorded. Ten radiographs were performed at each technique to minimize the impact of noise. The images were transferred to a digital workstation and automated analysis of the CDRAD 2.0 contrast detail phantom images was performed.

Results: The half value layer was calculated to be 2.83 mm Al, at a kVp of 81. The mean entrance detector dose, using the hospital technique, was 1.46 mR ± 0.02. In the results table below, the data on the left was obtained with an entrance detector dose of approximately 1.46 mR. The data on the right was with a fixed mAs.

<table>
<thead>
<tr>
<th>Grid</th>
<th>kVp</th>
<th>mAs</th>
<th>Detected %</th>
<th>Grid</th>
<th>kVp</th>
<th>mAs</th>
<th>Detected %</th>
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<td>2.5</td>
<td>72.36</td>
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</tbody>
</table>

Discussion/Conclusion: Presence of a grid has a moderate positive impact on phantom detection efficiency, at similar entrance detector doses. For identical radiographic techniques, the presence of a grid was of marginal benefit. This is best explained by increased signal to noise ratio from higher detector doses (SNR increase of approximately 1.8).
THORACIC RADIOGRAPHIC ANATOMY IN VERVET MONKEYS (*CHLOROCEBUS SABAEUS*).
A.N. Young, D. Rodriguez, W.M. du Plessis. Ross University, School of Veterinary Medicine, Basseterre, St. Kitts and Nevis.

**Introduction/Purpose:** The vervet monkey (*Chlorocebus sabaeus*) is commonly used in nonhuman primate research to evaluate important respiratory and cardiac pathogens. Despite their widespread use, the normal radiographic anatomy of the vervet monkey or closely associated species has not been described. Our goal was to establish reference values and report on the normal appearance of key structures assessed during thoracic radiographic evaluation, and to investigate appropriate radiographic technique.

**Methods:** Ten clinically healthy vervet monkeys from the research colony at the St. Kitts Behavior Science Foundation were evaluated. Subjects were sedated and placed under general anesthesia using ketamine and alfaxalone, respectively. Left to right lateral and posteroanterior (PA) thoracic radiographs were made using an Agfa 30-X computed radiography system.

**Results:** For lateral and PA radiographs, 2.5 mAs was used with a kVp (range 73-87) based on thoracic width (range 4.0-8.5 cm) or depth (range 7.0-9.0 cm). Detail of the superior thorax on PA radiographs improved when the limbs were extended laterally compared to superiorly. The following descriptive statistics are reported as mean ± standard deviation (range). The vertebral body lengths varied along the thoracic spine, with a T12 to T2 length ratio of 1.85 ± 0.08 (1.71-1.97). A mild diffuse bronchointerstitial pattern was present, partially obscuring evaluation of structures such as the inferior vena cava, aorta and pulmonary vessels. The lateral vertebral heart score (VHS) was 9.63 ± 0.45 (9.00-10.40), the PA VHS was 9.34 ± 0.40 (8.80-9.80), and the cardiothoracic ratio was 0.48 ± 0.03 (0.44-0.54). The inferior vena cava ratio to the aorta could only be determined in one subject due to poor vascular visibility. The vena cava ratio to the fourth rib could be assessed more readily (6/9), and measured 2.30 ± 0.36 (1.86-2.78). The pulmonary artery to ninth rib ratio on the right was 1.60 ± SD 0.30 (1.12-4.27). The ratio on the left was 1.54 ± SD 0.24 (1.29-1.99). The pulmonary veins were visualized poorly.

**Discussion/Conclusion:** The variation of vertebral length from superiorly to inferiorly in the thoracic spine may introduce inaccuracy in morphometric measurements made against the vertebrae. Reference values incorporating multiple measurements along the thoracic vertebrae, such as VHS, must be assessed critically, especially in light of diseased states. Assessment of vascular structures can be obscured by the mild bronchointerstitial lung pattern, believed to be attributed to mild atelectasis under anesthesia. In assessing the vena cava diameter, a ratio with the fourth rib is more consistently obtained as compared to a ratio with the aortic diameter. Evaluation of pulmonary veins on PA views may be obscured because of conformational differences of the vervet monkey in comparison to the dog or cat.
OPTIMISED MULTISLICE COMPUTED TOMOGRAPHIC (CT) PROTOCOL FOR THE NORMAL CANINE BRAIN.

M. Zarelli¹, T. Schwarz², A. Puggioni¹, M. Pinilla³, H. McAllister¹. ¹UCD, Ireland, ²The Royal (Dick) School of Veterinary Studies, Edinburgh, Scotland and ³Southern Counties Veterinary Specialists, Ringwood, UK.

Introduction/Purpose: CT of the brain is commonly performed in dogs with neurological signs to confirm or rule out brain pathology, particularly if MRI is not available. Due to the limited anatomic and contrast resolution of CT for the brain and numerous artefacts affecting image quality, it is essential to use an optimised CT protocol. Helical multislice CT technology offers many different scanning options for the brain the operator needs to choose from. The purpose of this study was to establish an optimised multislice-CT protocol.

Methods: The head of a fresh carcass of a 5 year old spaniel with no neurological signs was imaged. Images were acquired using a 4 slice helical CT unit. A total of 11 brain CT examinations were performed. The variable scanning parameters included: sequential/ helical mode, tube current, slice thickness, tube rotation time and collimator pitch. Images were reconstructed with different slice thicknesses, helical reconstruction intervals, image reconstruction algorithms and with or without an additional filter (PFO –posterior fossa optimization) to reduce beam-hardening artefacts. For each of the resulting 282 CT series, 3 transverse images of specific brain areas were selected and 1 median plane sagittal image was reconstructed, anonymised and saved in DICOM format. A WW/WL of 170/50 HU was used. The images were reviewed by three radiologists who assessed each image of the series with a numeric scoring system for image noise, blurring of brain structures, beam hardening and conspicuity of white/grey matter contrast, ventricular system and the caudoventral cerebellar margin. The total numeric value final score for each series was obtained for each reviewer separately. The smallest final score was considered the best CT series by each reviewer. An objective, quantitative analysis of the agreement between reviewers for each assessed parameter and each CT series, were analyzed separately with P values ≤ 0.05 considered statistically significant.

Results: There was overall agreement for the optimal CT protocol for all parameters: sequential mode, 300 mAs, 2 mm slice thickness, 1 sec tube rotation time, medium soft tissue algorithm and PFO filter applied. The best agreed series for each individual parameter assessed were also identified.

Discussion/Conclusion: Sequential imaging provides optimal image resolution. A relatively thin-sliced image provides a small blur due to partial volume artifact. Combined with a high tube current it allows a relatively low noise level. Medium frequency image reconstruction algorithm provides optimal contrast resolution for brain tissue. The PFO filter markedly reduced beam hardening artefacts.
RADIOGRAPHIC, CLINICAL AND CLINICOPATHOLOGICAL FEATURES OF ANGIOSTRONGYLOSIS IN DOGS FROM IRELAND.
M. Zarelli; B. Gallagher; S. Brennan; C. Mooney. University College Dublin, D4, Ireland.

Introduction/Purpose: The aim of this retrospective study was to identify radiographic features, signalment, clinical, clinicopathological and outcome of Angiostrongylosis in a series of dogs in Ireland.

Methods: The case records of the University Veterinary Hospital between 1999 and may 2012 were retrospectively reviewed and only patients with a positive diagnosis of angiostrongylosis, based on results of modified Baermann, zinc sulfate flotation, BAL, PCR, or post mortem examination, were included in the study. The radiographic examinations were reviewed and pulmonary pattern, presence of pulmonary vascular lesions, pleural effusion, pneumothorax, hilar lymphadenopathy, cardiac enlargement and tracheal abnormalities were evaluated.

Results: Study population: In total 27 clinical cases with a confirmed diagnosis of angiostrongylosis as determined by modified Baermann (n = 19), zinc sulfate flotation (n=1), BAL (n = 1), PCR (n = 1) or post mortem examination (n = 5) were identified. The group comprised 10 (37%) males, 17 (63%) females including 23 pedigree [German shepherd (n = 3), Cocker Spaniel (n = 2), Labrador retriever (n = 2), Jack Russell terrier (n = 2), Boxer (n = 2), Chihuahua (n = 2) and 1 each of a variety of other breeds] and 4 crossbreed dogs. The median age was 20 months (range 0.3-12.0 years) and 9 (33%) cases were > 2 years. Clinical features included cardiorespiratory (66%), coagulopathy (55%) and other (63%) signs. Two cases were severely anaemic (PCV < 0.2 L/L). Four had severe thrombocytopenia (< 60 x 10⁹/L). PT and aPTT values, assessed in 14 of the animals with clinical evidence of coagulopathy, were prolonged in 3 (21%). BMBT was performed in 12 of these animals and was prolonged in 7 (58%) cases. Radiographic findings: Thoracic radiographs (n = 26) identified abnormalities in 23 (88%) cases. These included bronchointerstitial [n=9(34%)], interstitial [n = 6 (23%)] alveolar-interstitial [n = 4 (15%)] and alveolar [n = 4 (15%)] patterns. Most patterns were described as diffuse. A pneumothorax developed in one case with a pulmonary bulla. A full course of fenbendazole (50 mg/kg PO q 24 hours for at least 5 days) was administered in 26 cases. Of these, 20 (74%) animals responded and recovered fully. There was limited response in 3 (11%) animals that were subsequently euthanased. Repeat radiographs were available in six cases that completed a full course of anthelmintic treatment. All cases persistently had radiographic abnormalities despite a full clinical recovery and negative faecal Baermann flotations.

Discussion/Conclusion: Angiostrongylosis is not an uncommon condition in a variety of Irish dog breeds and is not just confined to young dogs. Thoracic radiography is very useful for the evaluation of the clinical stage of canine patients suspected of Angiostrongylosis.
MULTI-DETECTOR CT UROGRAPHY PROTOCOL DESIGN AND OPTIMIZATION.
A.R. zur Linden¹, E.A. Riedesel¹, K. Alexander². College of Veterinary Medicine, Iowa State University, Ames, IA, 50011¹; Faculté de médecine vétérinaire, Université de Montréal, St-Hyacinthe, Québec, Canada, J2S 7C6.²

Introduction/Purpose: Computed tomography (CT) can be used for anatomical imaging of the upper urinary tract; and dynamic CT used for functional imaging by assessing the plasma clearance of iodinated contrast medium. Indications for CT urography include hematuria without evidence of stranguria or pain, trauma, assessment of congenital anomalies, neoplasia, and renal vasculature prior to renal transplantation. A CT urography protocol was evaluated for its ability to provide anatomical and functional information on the upper urinary tract in a single study, minimize the number of CT images, and limit radiation exposure to the patient.

Methods: Six healthy adult Beagles (8.5-10 kg) were used to determine the optimal contrast dosage to be used for a triple bolus CT technique, and develop a method to image the hilus of each kidney with dynamic CT. All dogs were anesthetized with a standardized protocol. Three dosages were tested (0.7, 1.05 and 1.4 ml/kg 240 mg/ml iohexol, administered over 10 seconds) and image quality assessed subjectively. A protocol was developed to move the CT table between the hilus of each kidney every 3 seconds to acquire functional data. Six client-owned dogs (various breeds, 9-31 kg) were then used to assess the aid of furosemide for visualization of the ureters with contrast medium using this protocol. Three dogs received furosemide (0.5 mg/kg intravenously 15 minutes prior to contrast injection) and three control dogs were administered an equal volume of saline. Ureteral filling was subjectively assessed and CT-glomerular filtration rate (CT-GFR) was also calculated for each kidney using the Patlak method.

Results: This protocol includes a non-contrast enhanced scan, a 3-minute dynamic scan at each renal hilus, and a single post-contrast scan performed 8 minutes after the initial dose of contrast. Optimal contrast dosage was 1.05 ml/kg. This dosage is administered three times; first for the dynamic scan, the second one timed for nephrographic phase enhancement and the third one timed for peak aortic enhancement using the timing from the dynamic scan. These timed injections result in contrast enhancement of the ureters, kidneys, and vasculature in a single scan. Furosemide administration resulted in subjectively improved visualization of the kidneys without contrast streaking artifacts in the renal pelvis, but did not improve contrast filling of the ureters. CT-GFR results from this study were similar to those obtained in previous studies; furosemide group 1.68-3.37 ml/min/kg and control group 1.58-2.40 ml/min/kg.

Discussion/Conclusion: This pilot study demonstrated that a triple-bolus technique and single post-contrast CT scan results in a complete and optimized anatomical study of the upper urinary tract. Furosemide administration improves the visualization of the renal pelvis by diluting contrast medium but does not improve ureteral filling. CT-GFR can be calculated for each kidney as part of this protocol, even in patients with asymmetrically positioned kidneys.
Saturday, October 20, 2012 - ACVR

7:00 am  
Registration Opens  
Registration Desk 1, Office A

7:30 am  
Society of Veterinary Nuclear Medicine Meeting  
Milan 4, 5, 7, 8

**Nuclear Medicine/Ultrasound**  
*Scientific Session 4*  
(Moderator: Dr. Kip Berry)

8:00 am  
PRELIMINARY FINDINGS ON FDG PET AND MULTIPHASIC CT OF LIVER MASSES IN DOGS.  
E. A. Ballegeer, C.M. Kunst, K.L. Berger, B. Stanley.  Michigan State University, MI 48824.

8:12 am  
DEVELOPMENT OF POLYMER-MEDIATED RADIONUCLIDE THERAPIES FOR TARGETING OSTEOSARCOMA.  
S. Popwell1, C. Berry2, R. Milner3, W. Bolch4, C. Batich5, K.B. Wagener6.  1College of Engineering, 2College of Liberal Arts and Sciences and 3College of Veterinary Medicine, University of Florida, Gainesville, FL, 32610.

8:24 am  
μPET/CT ASSESSMENT OF LUNG METASTASIS IN A MOUSE MODEL OF OSTEOSARCOMA.  
A.K. McMurray, M.J. Allen, W.T. Drost, B.K. Chaffee, K.A. Powell.  The Ohio State University College of Veterinary Medicine, Ohio, 43210.

8:36 am  
PREVALENCE OF SUBCLINICAL THYROID NODULES IN DOGS PRESENTING WITH HYPERCALCEMIA.  
L.K. Bohannon, R.E. Pollard, E.C. Feldman.  School of Veterinary Medicine, University of California, Davis, CA 95616.

8:48 am  
ALTERATION OF THE ECHO DROP-OUT ARTIFACT ON THE BLADDER WALL.  
N.C. Helfrich, H.G. Heng.  Purdue University College of Veterinary Medicine, Department of Veterinary Clinical Sciences, West Lafayette, IN 47907.

9:00 am  
THE SONOGRAPHIC APPEARANCE OF LIPIDURIA IN CATS.  
M.D. Sislak, K.A. Spaulding, D. Zoran, J. Bauer, J. Thompson.  College of Veterinary Medicine, Texas A&M University, College Station, TX  77843.

9:12 am  
ELASTOGRAPHY OF NORMAL CAT LIVER, SPLEEN AND KIDNEYS.  
J.W. White, J.S. Mattoon.  Washington State University, WA 99163.

9:24 am  
B-MODE AND POWER DOPPLER ULTRASONOGRAPHIC FINDINGS IN CANINE METASTATIC LYMPH NODES FROM MALIGNANT MAMMARY TUMOR.  
C. Muramoto, S.C.F. Hagen;  A.C.B.C. Fonseca-Pinto, C.M. Oliveira; M. Faustino; M.S.F. Talib; L.N, F.A. Sterman.  Torres.  School of Veterinary Medicine and Animal Science, University of São Paulo, Brazil 05508 270.

9:36 am  
ULTRASOUND-GUIDED CERVICAL FACET JOINT INJECTION IN THE DOG.  
M. Levy1, A. LeRoux1, H. Bragulla2, N. Rademacher1, L.Gaschen1.  Louisiana State University, 1Veterinary Clinical Sciences and 2Comparative Biomedical Sciences, Louisiana, 70803.
MICROBUBBLE ULTRASOUND FOR DRUG DELIVERY TO THE POSTERIOR SEGMENT OF THE EYE USING THE SUPRACHOROIDAL SPACE. G.S. Seiler¹, S. Feingold², P.A. Dayton², S.E. Cartiff³, R. Mantuo¹, J.H. Salmon¹, B.C. Gilger¹.¹NC State University, NC 27607; ²NC State and UNC Chapel Hill, NC 27514.

10:00 am Break with Exhibitors Molise

CT/MRI Scientific Session 5 Milan 4, 5, 7, 8
(Moderator: Dr. Silke Hecht)

10:30 am COMPARISON OF ¹T-MRI ARTHROGRAPHY AND 64-SLICE CT ARTHROGRAPHY FOR DETECTION OF ARTHROSCOPICALLY INDUCED LESIONS OF THE CANINE STIFLE. S. Nemanic, J.J. Warnock, S.M. Stieger-Vanegas. Oregon State University, OR 97331.

10:42 am VALIDATION OF A SHORT PREOPERATIVE MR PROTOCOL IN DOGS WITH CRANIAL CRUCIATE LIGAMENT DAMAGE. J. Olive, M.A. d'Anjou, N. Chailleux, J. Cabassu, R. Bélanger, L. Blond. CHUV, Faculty of Veterinary Medicine, Montreal University, QC, J2S5Z5, Canada.

10:54 am CT IDENTIFICATION OF DYSPLASIA AND PROGRESSION OF OSTEOARTHRITIS IN DOG ELBOWS PREVIOUSLY ASSIGNED OFA GRADE 1. C.M. Kunst, G. Habing, E.A. Ballegeer. Michigan State University, MI 48824.

11:06 am FEASIBILITY OF MAGNETIC RESONANCE IMAGING OF POST-OPERATIVE TIBIAL PLATEAU LEVELING OSTEOTOMY. S.L. Pownder¹², M.F. Koff¹, P.J. Shah¹, A.S. Levien², R.A. Bennett¹, H.G. Potter¹. ¹Hospital for Special Surgery, NY, 10021; ²Animal Medical Center, NY, 10021.

11:18 am SENSITIVITY, POSITIVE PREDICTIVE VALUE AND INTEROBSERVER VARIABILITY OF CT IN THE DIAGNOSIS OF BULLAE/BLEBS IN DOGS WITH SPONTANEOUS PNEUMOTHORAX. J.A. Reetz¹, A. Caceres¹, J.N .Suran¹, T. Oura², A. Zwingenberger², W. Mai¹. ¹University of Pennsylvania School of Veterinary Medicine, Philadelphia, PA, 19104; ²North Carolina State University College of Veterinary Medicine, Raleigh, NC, 27607(2); ³University of California Davis School of Veterinary Medicine, Davis, CA 95616.

11:30 am COMPARATIVE IMAGING IN THE CANINE ACUTE ABDOMEN: SURVEY RADIOGRAPHY, CONTRAST-ENHANCED ULTRASOUND, AND CONTRAST-ENHANCED MULTI-DETECTOR HELICAL CT. M.M. Shanaman, T. Schwarz, A. Gal, R.T. O'Brien. Department of Veterinary Clinical Medicine, University of Illinois at Urbana-Champaign, IL, 61802.

11:42 am FELINE OBSTRUCTIVE URETEROLITHIASIS: UTILITY OF COMPUTED TOMOGRAPHY AND ULTRASOUND IN CLINICAL DECISION MAKING. A.H. Carr, E.R. Wisner, J.L. Westropp, P.D. Mayhew. Veterinary Medical Teaching Hospital, University of California-Davis, CA, 95616.

12:00 pm Lunch on Your Own
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<td>ACVR Image Interpretation Session – Dr. Randi Drees, Program Co-chair</td>
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<td>Confirmation and Recognition of New ACVR Diplomates</td>
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PRELIMINARY FINDINGS ON FDG PET AND MULTIPHASIC CT OF LIVER MASSES IN DOGS.
E. A. Balleger, C.M. Kunst, K.L. Berger, B. Stanley. Michigan State University, MI 48824.

Introduction/Purpose: The correlation of FDG PET signal, and simultaneously collected contrast-enhanced computed tomography (CT) images in spontaneous canine hepatic masses with histopathological diagnosis of the mass obtained with surgical biopsy can lead to advancement towards non-invasive methods of diagnosing underlying processes. Additional benefit to the patient exists as whole body PET scan represents a screening process to rule out distant primary tumor or metastases.

Methods: Twelve client-owned dogs with spontaneous masses in the liver discovered on ultrasound and exceeding 3 cm in diameter were enrolled between 1/2010 and 5/2012. Each received an intravenous injection of 18F-fluorodeoxyglucose, dosage ranging from 5.9 to 22.9 MBq/kg, 1 hour prior to scanning. A PET and multiphasic CT was performed, with injection of 800 mg I/kg iopamidol administration before arterial and venous phase images were collected. At review of images with the surgeon, therapy decision changes based on imaging were recorded. Each patient then had a laparoscopic or open surgical biopsy of the mass(es) within 1 week after imaging to correlate with images with histopathology. Analysis of images for attenuation, contrast enhancement, and radiopharmaceutical uptake was performed on MedView® software.

Results: Fifteen masses in the twelve dogs were histopathologically correlated with imaging results. 4/15 (26.7%) masses were benign, while 11/15 (73.3%) were malignant in origin. Malignant masses included 4 well differentiated hepatocellular carcinomas. All masses with peripheral arterial enhancement pattern were malignant, and benign masses tended to have higher magnitude increase in attenuation between arterial and venous phases of contrast uptake. The highest standardized uptake value (SUV_{max}) was in a plasma cell tumor at 7, but the lowest at 2.4 was also in a malignant mass, a well-differentiated hepatocellular carcinoma. The mean SUV_{max} for malignant masses was 4.08, while for benign masses, it was 3.4. CT examination resulted in case management decision change in 10/12 (83.3%) cases, while PET examination resulted in change in 8/12 (66.7%).

Discussion/Conclusion: Considerable overlap in quantification of signal between benign and malignant hepatic processes on both CT and FDG PET examination exists, though larger case numbers may elucidate a difference not yet seen. Whole body screening commonly leads to therapeutic decision changes, and reveals distant disease that can affect overall outcome or increase suspicion of malignancy in the canine patient.

Funding for this study was provided by the Morris Animal Foundation.
Development of Polymer-Mediated Radionuclide Therapies for Targeting Osteosarcoma.

S. Popwell, C. Berry, R. Milner, W. Bolch, C. Batich, K.B. Wagener. College of Engineering (Popwell, Bolch, Batich), College of Liberal Arts and Sciences (Wagener) and College of Veterinary Medicine (Berry, Milner), University of Florida, Gainesville, FL, 32610.

Introduction/Purpose: A key limitation to current radionuclide therapies for treating osteosarcoma is uptake of the radiopharmaceutical by healthy tissue, particularly bone marrow. A potential novel solution is to increase the molecular weight of the radiopharmaceutical, such that it is too large to pass through the endothelial junctions and capillary beds of healthy tissue but is still small enough to pass through the defective vasculature created during tumor angiogenesis. This method of cancer-targeting drug design is termed the Enhanced Permeability and Retention (EPR) effect and offers potential for the development of new systemic radiotherapies for the treatment of osteosarcoma. A series of phosphonate-functionalized polymer ligands (PEI-MP and PEI-EDTMP), capable of binding radionuclides, have been synthesized and fully characterized for drug delivery applications.¹

Methods: In the current study, client-owned dogs with a diagnosis of osteosarcoma were administered approximately 370 MBq of ⁹⁹ᵐTc-PEI-MP (n=9) or ⁹⁹ᵐTc-PEI-EDTMP (n=1). Scintigraphic images were collected as an initial dynamic study for 30 minutes (right or left laterals centred over the thorax and abdomen) followed by static images (45, 60, 120 and 180 minutes) of the thorax and abdomen and primary tumor. Decay corrected, time-activity curves were created for analysis of biodistribution in non-target organs and tumor uptake.

Results: ⁹⁹ᵐTc-PEI-MP and ⁹⁹ᵐTc-PEI-EDTMP was retained within the dogs with osteosarcoma, with documented accumulation by 30 minutes. Peak radioactivity within the tumor occurred by 120 minutes. There was additional localization in healthy, non-target tissue that was noted to be less than current FDA approved small molecule therapies. Of particular significance is that there was not significant uptake compared with background radioactivity in potential dose limiting bone marrow (humeral, femoral or vertebral regions of interest).

Discussion/Conclusion: High molecular weight, polymer-radiopharmaceuticals have demonstrated uptake and retention in canine appendicular osteosarcoma tumors. Uptake of the radiopharmaceutical was not seen in non-target bone and the dose-limiting organ, bone marrow. These results offer promise for a new systemic therapy for treating canine osteosarcoma. Additionally, spontaneously occurring osteosarcoma of the canine has shown to be a good translational model for the study of osteosarcoma in humans. The potential use of PEI-MP and PEI-EDTMP with Sm-153 for delivery of significant radiation dose to these tumors without the rate limiting issues of bone marrow toxicity as seen with Sm-153 Quadrinmet® will be investigated in the future.

μPET/CT ASSESSMENT OF LUNG METASTASIS IN A MOUSE MODEL OF OSTEOSARCOMA.
A.K. McMurray, M.J. Allen, W.T. Drost, B.K. Chaffee, K.A. Powell. The Ohio State University College of Veterinary Medicine, Ohio, 43210.

Introduction/Purpose: Pulmonary metastatic load is a method of determining treatment response in patients with many different types of cancer including osteosarcoma, which is of significant importance in veterinary and human medicine. An objective in-vivo method for measuring the efficacy of treatments is currently lacking, with most studies involving euthanasia of mice at different time points to track the effect of treatment via histopathology. This strategy requires large numbers of mice and precludes the assessment of individual treatment response. Our purpose was to determine whether μPET/CT is more sensitive for the detection of pulmonary metastasis than μCT alone and whether active pulmonary metastatic load could be quantified using μPET.

Methods: Twelve mice had canine osteosarcoma cells injected into their right tibias. Mice were imaged at 3 and 5 weeks post-injection. The μCT and μPET/CT combined images were evaluated for metastasis at each time point and the results compared. Volumes of interest (VOI) were drawn around the lungs on each CT slice of all CTs. The VOIs were applied to the corresponding co-registered PET images. The standard uptake value (SUV) for the lungs was divided by the corresponding liver SUV. The SUV ratios were compared between time points for each mouse, as well as between mice within a given time point. Mice were euthanized after imaging at 5 weeks and histopathology and stereologic analysis were performed on paraffin-embedded sections of the lungs.

Results: CT images were reviewed for evidence of pulmonary metastasis with and without the assistance of co-registered PET images. 9/12 (75%) mice had metastasis at 3 weeks post-injection and 10/12 (83%) mice had metastasis 5 weeks post-injection. PET and CT correlated for 70% of the nodules, 15% of the time PET lead to the discovery of a nodule initially not detected on CT, 10% of the time PET indicated a nodule that could not be seen on the corresponding CT, and 5% of nodules on CT did not have \(^{18}\text{F-FDG}\) uptake. A statistical difference was not found between the 2 time points (paired t test p= 0.075). SUV values at 5 weeks but did not correlate to metastatic load.

Discussion/Conclusion: μPET/CT was helpful in detecting pulmonary nodules before they were evident on μCT, as well as confirming those nodules that were not initially detected or suspect on μCT. μPET does not quantitate pulmonary metastatic load. Possible reasons for this include change in lung area that occurs with normal breathing or atelectasis, variable uptake between the two time points, necrosis of tumor or overlap of signal from other nearby anatomic structures (i.e. heart, ribs etc).
PREVALENCE OF SUBCLINICAL THYROID NODULES IN DOGS PRESENTING WITH HYPERCALCEMIA.
L.K. Bohannon, R.E. Pollard, E.C. Feldman. School of Veterinary Medicine, University of California, Davis, CA 95616.

Introduction/Purpose: The purpose of this study was to determine the prevalence of subclinical thyroid nodules in dogs that undergo cervical ultrasound as a diagnostic procedure for the assessment of hypercalcemia. Our hypothesis is that incidental thyroid masses are present in dogs.

Methods: All dogs that underwent a cervical ultrasound examination as a component of the diagnostic assessment for hypercalcemia at the University of California, Davis Veterinary Medical Teaching Hospital between January 2010 and December 2011 were considered for inclusion. Dogs with a palpable neck mass where a thyroid gland lesion might have been suspected were excluded. Medical records were reviewed for signalment; clinical features; and results of clinicopathologic testing; endocrine testing and diagnostic imaging. Retrospective evaluations of cervical ultrasound images were performed and the presence or absence and number of thyroid nodules were recorded. The length, width, and height of the thyroid nodule were determined. The results of nodule aspirate, biopsy or necropsy were recorded when available.

Results: Fifty-four dogs met the inclusion criteria. Ultrasound found that 8/54 (15%) dogs had at least one thyroid mass. Of the 8 dogs with a thyroid mass 3 had a histological diagnosis. 1/8 (13%) had 2 thyroid masses 1 of which was a thyroid gland follicular adenoma (length 0.52 cm, width 0.55 cm, height 0.50 cm) and the other was a follicular cyst (length 1.1 cm, width 0.90 cm, height 0.91 cm), 1/8 (13%) had nodular hyperplasia (length 2.75 cm, width 1.25 cm, height 1.19 cm), and 1/8 (13%) had thyroid carcinoma (length 2.05 cm, width 2.16, and height 1.22 cm).

Discussion/Conclusion: The results suggest subclinical thyroid masses are present in dogs who initially present for hypercalcemia without a palpable neck mass. The clinical significance and management of incidentally identified thyroid nodules found during cervical ultrasound deserves further investigation.
Introduction/Purpose: The echo drop-out artifact is commonly encountered along the cranial curvature of a bladder wall in patients with peritoneal effusion. Formation of the artifact is due to refraction of the ultrasound beam at this region in addition to the different sound velocities through urine and the peritoneal effusion. The resultant sonographic image is an incomplete or defect of the bladder wall which could be mistaken by general practitioners for a pathologic condition. Spatial compound imaging (SCI) has been shown to alter the appearances of some sonographic artifacts. The effect of SCI on echo drop-out artifact, however, has not been investigated. The purpose of this study was to investigate and report the optimal ultrasound modality for prevention of echo drop-out artifact.

Methods: An abdominal ultrasound was performed on a patient with spontaneous peritoneal effusion. The sonographic appearance of the cranial aspect of the urinary bladder wall was examined using both conventional ultrasound imaging and SCI with both microconvex and linear transducers. The influence of the focal spot locations was investigated by placing the focal spot at the near, middle and far field. In additional to this, the effect of the number of overlapping images with SCI of the linear transducer was investigated by repeating the ultrasound examination with 3, 5 and 7 overlapping images. With the microconvex transducer, only 3 overlapping images with SCI were used. All still images were examined to determine the presence or absence of an echo drop-out artifact. Sonographic examination of an additional 3 dogs with spontaneous peritoneal effusion using the same setting that led to absence of the echo drop-out artifact of the cranial bladder wall was performed.

Results: Echo drop-out artifact was present in studies performed with microconvex transducer using both conventional and SCI modes. When using the linear array transducer, the echo drop-out artifact was absent with SCI (5 and 7 overlapping images) when the focal spot is located at the middle and far field. With the SCI of 3 overlapping images, the echo drop-out artifact persists. The 3 other dogs with spontaneous peritoneal effusion exhibited the same alteration of the echo drop-out artifact when they were examined with a linear transducer with SCI of 5 overlapping images.

Discussion/Conclusion: SCI can prevent the echo drop-out artifact because of the multiple insonation angles (multiple overlapping images) for image acquisition. The absence of the artifact was best observed when the study was performed with SCI of at least 5 overlapping images. The lack of a change in the appearance of the echo drop-out artifact with microconvex transducer with SCI was attributed to less number of overlapping images.
THE SONOGRAPHIC APPEARANCE OF LIPIDURIA IN CATS.
M.D. Sislak, K.A. Spaulding, D. Zoran, J. Bauer, J. Thompson. College of Veterinary Medicine, Texas A&M University, College Station, TX 77843.

Introduction/Purpose: Echoes in the urinary bladder of cats have been attributed to cells (hematuria, pyuria), blood clots, crystals, calculi, and lipid. Fat deposition is common in the feline kidney, resulting in hyperechogenicity of the kidney. Lipid droplets identified on urine sediment analysis are due to lipid shedding from the renal proximal convoluted tubule and are presumed a benign, normal occurrence in cats. In people, thin layer chromatography (TLC) is used to characterize and quantitate urine lipid. TLC allows diagnosis of clinically important lipiduria in patients with nephrotic syndrome, chronic renal disease, and hyperlipidemia. The purpose of this study was to determine the sonographic characteristics of lipiduria in clinically healthy cats and quantify the amount of urine lipid using TLC.

Methods: Clinically healthy cats were included and assigned a body condition score (1-9 scale). All cats had a complete abdominal ultrasound, urinalysis (UA), and chemistry panel performed. Cats were excluded if significant abnormalities were detected on ultrasound (other than the presence of echoes in the urinary bladder), UA (other than the presence of lipid), or the chemistry panel. The urinary bladder was scored as having none, few, mild, moderate, or many echoes. The location of echoes was recorded as dependent, suspended, or floating. The presence of twinkle artifact, reverberation artifact, or distal acoustic shadowing associated with the echoes was recorded, as was the echogenicity of each kidney with respect to the liver and spleen. Urine lipid on UA was graded as none, few, moderate, or many. The amount of lipid present in the urine was determined by TLC (mg / 500µL). A Fisher’s Exact Test was utilized to test for correlations with significance defined as $P < 0.05$.

Results: Twenty-two cats were included. Twenty (91%) had echoes in the urinary bladder on ultrasound (few=4, mild=12, moderate=4, many=0). Of these, nineteen (95%) had suspended echoes and no distal acoustic shadowing, reverberation, or twinkle artifact. All cats had urine lipid detected on UA (few=4, moderate=10, many=8) and TLC (1.6 – 33.0 mg/500 µL). There was no association between the sonographic score of echoes and the amount of lipid detected on UA ($p=0.61$) or TLC ($p=0.90$). Cats with kidneys of equal or greater echogenicity than the spleen were significantly more likely to have moderate or many echoes detected in the urinary bladder ($p=0.017$). There was no association of body condition score with the amount of echoes seen on ultrasound or the amount of lipid detected by UA or TLC.

Discussion/Conclusion: We conclude that lipid can be detected by ultrasound in normal cats as suspended echoes that do not cause distal acoustic shadowing, reverberation, or twinkle artifact. However, ultrasound does not appear to be reliable for determining the amount of urine lipid. Cats with hyperechoic kidneys tended to have more echoes detected in the urinary bladder which suggests that these cats may be shedding more lipid from the proximal convoluted tubule. The echogenicity of the kidney and amount of urine lipid is not associated with total body fat as assessed by body condition score.
ELASTOGRAPHY OF NORMAL CAT LIVER, SPLEEN AND KIDNEYS.
J.W. White, J.S. Mattoon. Washington State University, WA 99163.

Introduction/Purpose: Elastography evaluates tissue compressibility from manual oscillations of the ultrasound transducer, displayed as a color map overlay on a B-mode image. Extensive research exists in human medicine. A recent study defined its use for imaging equine distal limbs. There are no publications of its utility in clinical small animal medicine. The purpose of our study was to evaluate the technique and define the appearance of normal cat liver, spleen and kidneys.

Methods: Ten healthy cats presented to the WSU VTH for routine spay/neuter from animal shelters were included. Elastography was performed with a linear array transducer on unsedated cats. Cytology confirmed normalcy of organs. In addition to subjective evaluation, objective assessment was performed using custom software assigning numeric values (0 = greatest strain to 255 = no strain) to color pixels within regions of interest (ROI) drawn in Image J. ROIs were placed within the body wall (BW), spleen (SPL), liver (LIV), left renal cortex (LRC), left renal near field (LRNF), right renal cortex (RRC) and right renal near field (RRNF).

Results: The mean ± standard deviation (SD) strain values were: BW 208 ± 14, CI(µBW, 0.95) = [199; 217]; SPL 135 ± 17 CI(µSPL, 0.95) = [125; 145]; LIV 125 ± 15, CI(µLIV, 0.95) = [115; 135]; LRC 81 ± 36, CI(µLRC, 0.95) = [58; 104], LRNF 128 ± 13, CI(µLRNF, 0.95) = [120; 136]; RRC 93 ± 29, CI(µRRC, 0.95) = [75; 111]; and RRNF 121 ± 17, CI(µRRNF, 0.95) = [110; 132]. Strain values were not significantly different between the following groups (p > 0.05): SPL, LIV, LRNF and RRNF; LRC and RRC; RRC and RRNF. BW was significantly different from all other groups (p < 0.05). Strain ratios ± SD between BW:SPL = 1.60 ± 0.20, BW:LIV = 1.74 ± 0.33, BW:LRC = 3.12 ± 1.83, BW:LRNF = 1.54 ± 0.31, BW:RRC = 2.51 ± 0.93 and BW:RRNF = 1.79 ± 0.37.

Discussion/Conclusion: Elastography was found to be useful in assessment of the cat body wall, liver, spleen and kidneys. Organ appearance was consistent within and between cats. Elastic properties of liver, spleen and renal near field were similar; softer renal cortex was easily differentiated from firmer medulla.

2. Kwang Gi Kim, Biomedical Engineering Brach, Division of Convergence Technology, National Cancer Center, Korea.
B-MODE AND POWER DOPPLER ULTRASONOGRAPHIC FINDINGS IN CANINE METASTATIC LYMPH NODES FROM MALIGNANT MAMMARY TUMOR.

C. Muramoto, S.C.F. Hagen; A.C.B.C. Fonseca-Pinto, C.M. Oliveira; M. Faustino; M.S.F. Talib; L.N, F.A. Sterman. Torres. School of Veterinary Medicine and Animal Science, University of São Paulo, Brazil 05508 270.

Introduction/Purpose: Carcinoma is the most common type of malign mammary tumor in bitches, which have great potential to metastasise. The involvement of the lymph nodes is an important prognostic factor. The aim of this study was to report the ultrasound findings associated with metastatic lymph nodes in canine mammary cancer.

Methods: The ultrasound characteristics of the inguinal superficial lymph nodes (LN) of bitches with malign mammary tumors were evaluated with a 12MHz transducer in a HDI 5000 ultrasound machine (ATL®). B-mode study was performed to evaluate size (volume), contour, edge, shape, length to width ratio (L/W ratio), architecture, echotexture and echogenicity. The amount and distribution of the vessels were studied by power Doppler. Mamma and LN had histopathologic diagnosis. In this study were selected just the tumors associated with metastasis in at least one LN.

Results: Seven of 20 bitches with epithelial malign tumors (9 grade I, 6 grade II and 5 grade III) had LN metastasis. The histological types of these 7 tumors were: anaplastic carcinoma grade III, simple tubular adenocarcinoma grade II, simple tubule-papillary carcinoma grade III, simple solid carcinoma grade III. 17 metastatic LN were found. All affected LN had at least 5 abnormal ultrasound characteristics. The mean volume was 2.37±2.57cm³. 12 LN (70.6%) presented irregular contour; all 17 edges were well defined. Shape varied between normal oval shape (8 LN; 47.1%), round (6 LN; 35.3%) or amorphous (3 LN; 17.6%). 7 LN (41.2%) had the L/W ratio less than 2, and the remaining (58.8%), greater than 2. The majority (14 LN; 82.4%) had a disorganized architecture and 3 LN (17.6%) preserved the normal hyperechoic center and a hypoechoic rim. In just 1 LN (5.9%) the echotexture was maintained as roughly center and a homogeneous rim; the others showed it totally rough (6 LN; 35.3%), homogeneous (6 LN; 35.3%) or heterogeneous (4 LN; 23.5%). Just 1 LN was normal in echogenicity, 12 (70.6%) were hypoechoic and 4 hyperechoic. 9 (52.9%) presented a peripheral vessel distribution, 8 (47.1%) a mixed (hilar/peripheral) pattern and none of LNs had the normal hilar vessels distribution. The amount of identified vessels was high in 7 LN (41.2%), moderate in 5 and small in others 5 (29.4%).

Discussion/Conclusion: We observed an increased occurrence of metastasis as higher as the grade of tumor. It was suggested that LN metastasis might be part of the routine staging of the patients with mammary cancer. Ultrasonography, as an available imaging modality, can provide important information allowing the classification of the LN as metastatic. It should be considered suspicious for metastatic, those LN that group together at least 5 altered characteristics, especially those related to the contour, architecture, shape, echotexture, echogenicity and distribution of blood vessels.
ULTRASOUND-GUIDED CERVICAL FACET JOINT INJECTION IN THE DOG.
M. Levy1, A. LeRoux1, H. Bragulla2, N. Rademacher1, L.Gaschen1. Louisiana State University, 1Veterinary Clinical Sciences and 2Comparative Biomedical Sciences, Louisiana, 70803.

Introduction/Purpose: The ultrasound-guided injection of cervical facet joints is a well-established procedure in both humans and horses for neck pain resulting from osteoarthritis, but it has not been described in dogs. Spondylomyelopathy is a common disease in large breed dogs due to both disc disease and osseous lesions of the cervical spine and is a common source of neck pain. The purpose of this study was: 1. Describe the sonographic anatomy and landmarks for facet joint injections in the dog and develop a technique for injections. 2. Determine the accuracy of injections and the factors that may influence it. 3. Perform injections in affected dogs and assess clinical outcome.

Methods: Bony landmarks for each cervical facet joint from C2-3 to C7-T1 were established using linear ultrasound probe on a skeleton in a water bath. Each joint space on the right and left sides was injected individually under ultrasound guidance with 0.1 ml of solution of 10% gelatin and 33% Conray® iothalamate meglumine 282 mg/ml iodine. A computed tomographic (CT) scan was acquired following each injection, and an injection score was assigned. Age, gender, weight, body condition score, transverse and dorsal angle of each joint, neck diameter at each joint, and vertebral mensuration for each vertebra were recorded for each dog. Three client-owned dogs with cervical pain that had MRI to rule out compressive disc disease were injected at multiple sites where arthropathy was diagnosed with a 6% solution of triamcinolone.

Results: The transverse processes serve as excellent sonographic landmarks for identifying the cervical vertebral joints in dogs regardless of the size of the dog or location along the vertebrae. Accuracy of ultrasound-guided facet joint injection in dogs is high (83%) and similar to published techniques in horses. The three affected dogs all had relief of their cervical pain within 24 hours following facet joint injection, which lasted for at least 4 months.

Discussion/Conclusion: Ultrasound-guided intra-articular cervical facet joint injection is a feasible technique in the dog. Ultrasound-guided injection of the cervical articular facet joints with anti-inflammatory drugs warrants future clinical trials to determine safety and efficacy in treating arthrosis in dogs with spondylomyelopathy.
MICROBUBBLE ULTRASOUND FOR DRUG DELIVERY TO THE POSTERIOR SEGMENT OF THE EYE USING THE SUPRACHOROIDAL SPACE.

G.S. Seiler, S. Feingold, P.A. Dayton, S.E. Cartiff, R. Mantuo, J.H. Salmon, B.C. Gilger. NC State University, NC 27607; NC State and UNC Chapel Hill, NC 27514.

Introduction/Purpose: Drug delivery to the posterior segment of the eye is to a significant degree limited by the difficulty in delivering effective doses of drugs to the targeted tissues. Traditionally available approaches are either not effective or associated with potentially devastating side effects. Using the suprachoroidal space (SCS), a potential space between the sclera and choroid, may reduce side effects associated with intraocular injections, and may allow wide drug distribution to the posterior segment of the eye. The purpose of this research was to determine the real-time distribution of microbubbles after injection into the anterior SCS, and to determine feasibility of delivering dye to the retina using microbubbles as drug delivery vehicles.

Methods: SCS injections of 250, 500 and 800 uL of contrast agent (Targestar-P) were performed in 4 porcine cadaver eyes each. Contrast distribution was recorded using a Mylab70 ultrasound system. Percentage of distribution of contrast agent in the SCS was determined as mean (SD). Regions of interest were placed over the SCS, and contrast enhancement over time was measured using contrast detection software (Qontrast). For assessment of drug delivery to the retina, fresh canine cadaver eyes received an intravitreous (IV) or SCS injection (250 uL) of microbubble-incorporated dye (Diocadecyl-3,3',3'-tetramethylindocarbocyanine iodide, DiI). Eyes were simultaneously imaged with ultrasound and either received 0, 1, or 3 destructive pulses once the bubbles reached the ocular posterior segment. Eyes were frozen immediately and the amount of dye in the retina as observed on a fluorescent microscope was semi-quantified using a score of 0 (none) to 4 (retina saturated with DiI) by two masked observers. Mean cumulative scores were analyzed using Wilcoxon rank sum test and differences considered significant at P<0.05.

Results: Ultrasound imaging illustrated that microbubble contrast was present in the ocular posterior segment within 10 seconds of injection. There were no significant differences in the time of appearance or % distribution between the different volumes. Mean contrast distribution in the posterior SCS was 27.2%, and the posterior SCS was reached in 83.3% of eyes. Mean cumulative scores of retinal dye were similar between IV (2.0 +/- 1.7) and SCS (1.8 +/- 0.88) for DiI delivery with no destructive pulse, and slightly higher for 1 pulse microbubble delivery of DiI (IV: 2.9 +/- 1.4; SCS: 2.8 +/- 2.3). However, 3 pulse microbubble destruction resulted in significantly higher delivery of DiI to SCS (P=0.043) (4.1 +/- 0.8) compared to IV (2.7 +/- 1.1).

Discussion/Conclusion: The posterior SCS was rapidly and reliably reached when injecting microbubbles in the anterior SCS. Contrast ultrasound-mediated drug delivery via SCS injections may represent a novel, targeted and less invasive method for treatment of posterior segment ocular disease.
COMPARISON OF 1T-MRI ARTHROGRAPHY AND 64-SLICE CT ARTHROGRAPHY FOR DETECTION OF ARTHROSCOPICALLY INDUCED LESIONS OF THE CANINE STIFLE.

Introduction/Purpose: Stifle injury is the leading cause of canine lameness. MRI is superior to single-slice CT arthrography (CTA) in detecting stifle ligament lesions, and single-slice CTA did not reliably detect meniscal injuries. In this study we assessed the utility of 64-slice CTA to detect ligament, meniscal and cartilaginous injuries of the canine stifle, and compared CTA and MRI arthrography (MRA) for detection of the same arthroscopically induced lesions within the canine stifle.

Methods: 10 large breed (mean weight 30.4kg) canine cadaver stifles were utilized. Stifles were randomly assigned to receive arthroscopy alone, or arthroscopy with iatrogenic lesions to articular cartilage, menisci, and/or cruciate ligaments (0-4 lesions per stifle). Imaging performed after arthroscopy included CTA (64-multislice helical CT scanner, 80kVp, 350 mA, 1mm slice thickness; iopamidol 150mg I/ml, injected to joint distension) and T1-weighted MRA (1-Tesla MR scanner, TR 400, TE 13, 14cmx14cm, 256 x 192, 2mm slice thickness; gadopentetate dimeglumine 1:100 dilution, injected to joint distension) with images in transverse, sagittal, and frontal planes. Following imaging, lesions were photographed; India ink was used to detect cartilage damage. Images were assessed independently by 2 radiologists, blinded to lesion status.

Results: The number of arthroscopically induced lesions, number of lesions correctly and incorrectly detected by at least one radiologist, and sensitivity and specificity of CTA and MRA are listed in Table 1.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Cranial Cruciate Ligament</th>
<th>Caudal Cruciate Ligament</th>
<th>Medial meniscus</th>
<th>Lateral meniscus</th>
<th>Medial femur condyle</th>
<th>Lateral femur condyle</th>
<th>Medial tibial condyle</th>
<th>Lateral tibial condyle</th>
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</thead>
<tbody>
<tr>
<td>CTA correct</td>
<td>4 of 5</td>
<td>4 of 7</td>
<td>6 of 6</td>
<td>1 of 1</td>
<td>2 of 4</td>
<td>0 of 1</td>
<td>1 of 5</td>
<td>0 of 3</td>
</tr>
<tr>
<td>CTA incorrect</td>
<td>3 of 5</td>
<td>1 of 3</td>
<td>2 of 4</td>
<td>4 of 9</td>
<td>0 of 6</td>
<td>0 of 9</td>
<td>0 of 5</td>
<td>1 of 7</td>
</tr>
<tr>
<td>Sensitivity CTA</td>
<td>80.0%</td>
<td>57.1%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>50.0%</td>
<td>0.0%</td>
<td>20.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Specificity CTA</td>
<td>40.0%</td>
<td>66.7%</td>
<td>50.0%</td>
<td>55.6%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>85.7%</td>
</tr>
<tr>
<td>MRA correct</td>
<td>5 of 5</td>
<td>5 of 7</td>
<td>6 of 6</td>
<td>1 of 1</td>
<td>2 of 4</td>
<td>0 of 1</td>
<td>1 of 5</td>
<td>0 of 3</td>
</tr>
<tr>
<td>MRA incorrect</td>
<td>2 of 5</td>
<td>2 of 3</td>
<td>1 of 4</td>
<td>5 of 9</td>
<td>1 of 6</td>
<td>2 of 9</td>
<td>1 of 5</td>
<td>0 of 7</td>
</tr>
<tr>
<td>Sensitivity MRA</td>
<td>100.0%</td>
<td>71.4%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>50.0%</td>
<td>0.0%</td>
<td>20.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Specificity MRA</td>
<td>60.0%</td>
<td>33.3%</td>
<td>75.0%</td>
<td>44.4%</td>
<td>83.3%</td>
<td>77.8%</td>
<td>80.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Discussion/Conclusion: Both 64-slice CTA and MRA detected stifle ligament and meniscal injuries, but not cartilage damage. MRA was marginally better than CTA for cranial cruciate ligament and medial meniscal lesions.
VALIDATION OF A SHORT PREOPERATIVE MR PROTOCOL IN DOGS WITH CRANIAL CRUCIATE LIGAMENT DAMAGE.

J. Olive, M.A. d'Anjou, N. Chailleux, J. Cabassu, R. Bélanger, L. Blond. CHUV, Faculty of Veterinary Medicine, Montreal University, QC, J2S5Z5, Canada.

Introduction/Purpose: The objective of this prospective study was to validate a short preoperative MR imaging protocol of the canine stifle naturally affected by cranial cruciate rupture, for documenting meniscal and bone marrow lesions (BML).

Methods: The MR protocol defined for a 1.5T clinical system included dorsal T1-weighted gradient echo, dorsal proton density and sagittal fat-saturated dual echo sequences. The protocol took approximately 22 minutes for acquisition per-se and 30 minutes including positioning and piloting imaging planes. MR images were reviewed blindly by two radiologists, initially independently, then by consensus. Ligament damage and meniscal findings in 14 dogs were confirmed surgically.

Results: There was substantial interobserver agreement (k=0.63) to define each meniscus as normal, with a suspected internal lesion, or with a fissure reaching at least one meniscal surface. This agreement was raised to excellent (k=0.83) to classify meniscal fissure as present or absent. After consensus, there was 75% sensitivity and 100% specificity to detect medial meniscal fissure. Among the 3 cases in which the fissure was not identified, an internal lesion was described in two. Surgically, most medial meniscal fissures were longitudinal and curved, so-called “bucket-handle” lesions, one was a radial fissure, and all involved the caudal horn of that meniscus. The sole case of lateral meniscal fissure was obvious on MR for both observers but missed in surgery. In 9 out of 11 cases, the lesion pattern was correctly identified as bucket-handle type on MR. The radial fissure was misidentified on MR as an internal lesion. BML were present in all dogs, either subchondral, at the cruciate ligament entheses or underlying osteophytes. More specifically, the presence of caudomedial tibial subchondral BML had 100% positive predictive value for a fissure of the medial meniscus, although its negative predictive value was only 50%.

Discussion/Conclusion: In conclusion, a short imaging protocol using high-field MR has good capacity to distinguish cases requiring surgical exploration for meniscal injuries from those in which an invasive procedure can be avoided. Presence of a subchondral BML caudomedially in the tibial plateau strongly suggests overlying meniscal fissure.
Introduction/Purpose: Elbow dysplasia (ED) is a group of five recognized heritable conditions that affect young large breed dogs and typically lead to development of elbow osteoarthritis and pain. Radiography is not as sensitive as computed tomography (CT) in the detection of dysplastic lesions, however is sensitive in the detection of osteoarthritis. The Orthopedic Foundation for Animals (OFA) screens for ED by assessing a mediolateral radiograph of the elbow in flexion, and assigns grades 0-3 based on the height of the bony proliferation on the ulnar anconeal process (anconeal bump). Grades 1-3 are considered dysplastic, and those dogs are identified as poor breeding candidates. Many dogs assigned a grade 1 are never clinically lame, leading breeders to question the accuracy of the screening process. The purpose of this study is to determine the incidence of ED, as detected with CT imaging, in elbows previously assigned a grade 1 by the OFA. As CT is not 100% sensitive in the detection of ED, we will also describe the progression of osteoarthritis (OA) in these elbows, which may be indicative of ED in elbows otherwise normal on CT.

Methods: Twenty-three client-owned dogs who had at least one year previously been assigned an OFA grade 1 in one elbow, and a grade 1 or 0 (used for a control group) in the opposite elbow were recruited. CT and radiographic images of the elbows were acquired, and the original elbow radiographs sent to the OFA were obtained. The presence of ED and/or OA on CT and radiographs, and progression of OA on the radiographic studies from the two time points were compared between the grade 1 and grade 0 elbows. In addition to gross fragments, fissures, abnormally shaped, and hypo or hyperattenuating coronoid processes were defined as diseased.

Results: Of the 46 elbows (23 dogs), 13 were originally assigned a grade 0, and 33 were assigned a grade 1. On CT: of the 33 elbows assigned an OFA grade 1, 22 (67%) had fragmented medial coronoid process (8/22) or evidence of medial coronoid process disease (14/22). 4/33 (12%) elbows did not have evidence of fragmented nor diseased medial coronoid processes, but had elbow osteoarthritis. 7/33 (21%) did not have evidence of fragmented nor medial coronoid disease, nor elbow osteoarthritis. Of the 13 elbows assigned an OFA grade 0, 8 (62%) had fragmented medial coronoid process (2/8) or evidence of medial coronoid process disease (6/8). Of the 5/13 (38%) that did not have evidence of fragmented nor medial coronoid disease, none had evidence of osteoarthritis. On the original OFA radiographs, 9 elbows had evidence of osteoarthritis separate from the anconeal bump, only three of which demonstrated progression of osteoarthritis on radiographs taken at the second time point. All three were originally assigned a grade 1, and on CT had evidence of dysplasia.

Discussion/Conclusion: The proportion of elbows OFA grade of 1 and 0 with ED identified using CT was not significantly different. Progression of osteoarthritis on radiographs was identified in few elbows (3), all originally assigned grade 1 and positive for medial coronoid disease on CT.
FEASIBILITY OF MAGNETIC RESONANCE IMAGING OF POST-OPERATIVE TIBIAL PLATEAU LEVELING OSTEOTOMY.
S.L. Pownder\textsuperscript{1,2}, M.F. Koff\textsuperscript{1}, P.J. Shah\textsuperscript{2}, A.S. Levien\textsuperscript{2}, R.A. Bennett\textsuperscript{1}, H.G. Potter\textsuperscript{1}.

Introduction/Purpose: Evaluation of the instrumented canine stifle joint is technically challenging, and conventional radiographs and computed tomography fail to adequately address soft tissue injuries. MRI provides excellent soft tissue resolution; however, it suffers from susceptibility artifact in the presence of indwelling hardware. Additionally, common veterinary implants such as tibial plateau leveling osteotomy (TPLO) are stainless steel, which produces the greatest artifact among the metals available for implantation. Protocols to create diagnostic images of the canine stifle instrumented with stainless steel are needed as none currently exist.

Methods: A pilot study was performed using a cadaveric canine limb. A stainless steel TPLO implant was applied to the right stifle, and MRI was performed using narrow receiver bandwidth fast spin echo imaging (nbw-FSE), wide bandwidth FSE (wbw-FSE), and a prototype pulse sequence (multi-acquisition variable-resonance image combination [MAVRIC]), which is optimized to provide superior spectral coverage and reduced artifact. A scoring system was created to determined conspicuity of soft tissue structures (0-not seen, 1-seen). Twenty structures of the medial stifle joint were assessed including meniscal horns, ligament attachments, articular cartilage, and neurovascular structures. Comparisons were made to a non-instrumented limb using standard-of-care wbw-FSE.

Results: The instrumented limb received a score of 4/20 with nbw-FSE, 11/20 with wbw-FSE, and 14/20 with MAVRIC. A score of 15/20 was achieved when combining results of wbw-FSE and MAVRIC. The non-instrumented limb yielded a score of 20. Wbw-FSE yielded higher spatial resolution. MAVRIC demonstrated the greatest artifact reduction. Only MAVRIC was able to evaluate the medial meniscus in its entirety (Figure 1).

Discussion/Conclusion: Stainless steel TPLO implants create large susceptibility artifact that precludes evaluation of important soft tissue structures of the medial stifle joint, including articular hyaline cartilage and fibrocartilage when using traditional MRI pulse sequences. A combination of wbw-FSE and MAVRIC pulse sequences reduce susceptibility and aid in evaluation of the joint.
SENSITIVITY, POSITIVE PREDICTIVE VALUE AND INTEROBSERVER VARIABILITY OF CT IN THE DIAGNOSIS OF BULLAE/BLEBS IN DOGS WITH SPONTANEOUS PNEUMOTHORAX.
J.A. Reetz¹, A. Caceres¹, J.N. Suran¹, T. Oura², A. Zwingenberger³, W. Mai¹. ¹University of Pennsylvania School of Veterinary Medicine, Philadelphia, PA, 19104; ²North Carolina State University College of Veterinary Medicine, Raleigh, NC, 27607(2); ³University of California Davis School of Veterinary Medicine, Davis, CA 95616.

Introduction/Purpose: Rupture of pulmonary bullae/blebs is a common cause of spontaneous pneumothorax in dogs, but bullae/blebs are difficult to diagnose on thoracic radiographs. CT can reportedly identify more bullae/blebs than radiographs, but in the authors’ experience the use of CT in these cases can be unrewarding. The purpose of the study was to assess the sensitivity, positive predictive value and interobserver variability of CT for bulla/bleb visualization in dogs with spontaneous pneumothorax due to bulla/bleb rupture.

Methods: Dogs that had CT for spontaneous pneumothorax were included in the study if the diagnosis was bulla/bleb rupture, confirmed with surgery (median sternotomy) or necropsy and histopathology. 17 dogs were identified; due to multiple lesions in several dogs, lesion total was 24. Details obtained from the medical record included patient signalment, CT protocols, and bullae/bleb location (affected lobe), size (available in 18 lesions), and exact number (available in 17 affected lobes). Three radiologists blinded to final results reviewed the CT examinations and reported the number, size and location of bullae/blebs. They also subjectively graded severity of pneumothorax. Sensitivity and PPV were calculated, and interobserver variability was assessed using kappa statistics. For each reader, multivariate logistic regression was used to assess whether a correct diagnosis was associated with degree of pneumothorax, size of the bullae/blebs or slice thickness. Statistical significance was p < 0.05.

Results: CT protocols varied, but 16/17 had high-resolution series available. Sensitivity of bulla/bleb detection for the 3 readers was 41.7%, 54.2% and 58.3%. PPV value was 52.6%, 12.6% and 8%, with the latter 2 readers having a very high rate of false positives. There was good interobserver agreement (κ=0.64). Increasing size of the bulla/bleb was significantly associated with a correct CT diagnosis in one reader (p=0.048) and trended towards significance in the other two readers (p=0.058; 0.051). Correct diagnosis was not associated with slice thickness or degree of pneumothorax.

Discussion/Conclusion: Sensitivity of CT for bulla/bleb detection was relatively low. Lesion visibility was not affected by degree of pneumothorax or slice thickness, but there was a tendency for smaller lesions to be missed. When considering only the 24 confirmed lesions, interobserver variability was good for lesion detection, but there was a tendency to over-read CT exams; this is attributed to expectation bias for visual identification of bullae/blebs in patients with spontaneous pneumothorax. Although further study in this area is warranted, the current data suggests that full exploratory thoracotomy should be performed regardless of CT results, as bulla/bleb lesions can be missed or potentially over-diagnosed.
COMPARATIVE IMAGING IN THE CANINE ACUTE ABDOMEN: SURVEY RADIOGRAPHY, CONTRAST-ENHANCED ULTRASOUND, AND CONTRAST-ENHANCED MULTI-DETECTOR HELICAL CT.

M.M. Shanaman, T. Schwarz, A. Gal, R.T. O’Brien. Department of Veterinary Clinical Medicine, University of Illinois at Urbana-Champaign, IL, 61802.

Introduction/Purpose: Contrast-enhanced multi-detector computed tomography (CE-MDCT) is the current modality of choice in evaluating the human emergency patient with acute abdominal pain. The primary purpose of this study is to compare the diagnostic potential and agreement of survey radiography, combined B-Mode/contrast-enhanced ultrasound (CEUS) and CE-MDCT in evaluation of canine patients presenting with acute abdominal signs. We hypothesized that CE-MDCT would provide the most accurate staging and diagnosis of disease reliably differentiating surgical versus medical underlying conditions.

Methods: Nineteen dogs with acute abdominal signs were prospectively enrolled. All patients underwent routine abdominal radiography, B-mode and CEUS (the latter limited to identified lesion(s) with questionable perfusion) and dual-phase CE-MDCT. B-mode and CEUS images were evaluated prospectively by the primary author. Survey radiographic and CT images were evaluated retrospectively in a randomized blinded fashion by three independent reviewers (MMS, TS, RTO). Consensus was achieved for specific imaging findings.

Results: Eleven dogs were diagnosed with a condition requiring surgical intervention including hepatic abscessation (2), splenic abscess (sarcoma) with rupture (1), gastric perforation (B-cell lymphoma) (1), traumatic diaphragmatic hernia (1), and small intestinal mechanical ileus secondary to foreign body (6). CE-MDCT was the only modality to correctly identify all conditions requiring immediate surgical intervention. All small intestinal foreign bodies were visible on CT, 4 of which were linear in nature and each revealing a distinct and accurate zone of transition (confirmed by exploratory laparotomy). Spontaneous pneumoperitoneum was detected by both survey radiography and CT in two cases where routine ultrasound failed to do so. Routine ultrasound was most sensitive for detection of free fluid. CEUS provided improved sensitivity for detection of gastrointestinal hypoperfusion relative to CE-MDCT, although restricted field of view and patient motion were significant limitations.

Discussion/Conclusion: Survey radiography and routine B-mode ultrasound have inherent limitations including, but not limited to, superimposition of abdominal organs, non-specific findings, patient stress induced by manual restraint, duration of image acquisition and variable operator skill. We propose that CE-MDCT may effectively replace combined survey radiography and B-mode ultrasound in screening dogs with acute abdominal signs. A CT finding termed “mesenteric fat stranding” will be described for the first time in the veterinary literature and may prove beneficial in future studies as an estimation of severity of bowel ischemia. CEUS may be beneficial in evaluating lesions with questionable perfusion deficits following preliminary CE-MDCT evaluation.
FELINE OBSTRUCTIVE URETEROLITHIASIS: UTILITY OF COMPUTED TOMOGRAPHY AND ULTRASOUND IN CLINICAL DECISION MAKING.
A.H. Carr, E.R. Wisner, J.L. Westropp, P.D. Mayhew. Veterinary Medical Teaching Hospital, University of California-Davis, CA, 95616.

Introduction/Purpose: The clinical utility of ultrasound (US), unenhanced computed tomography (U-CT) and contrast-enhanced CT (CE-CT) were evaluated to assess diagnostic accuracy for detection of feline ureterolithiasis and ureteral obstruction.

Methods: Medical records were reviewed for feline patients with a diagnosis of ureteral disease. Inclusion criteria were an abdominal US examination followed by a contemporaneous abdominal CT study and either surgical or necropsy confirmation of diagnosis. US, U-CT and CE-CT images were evaluated for evidence of ureteral obstruction, presence of ureteroliths, and renal lesions including pylectasia/hydronephrosis.

Results: U-CT had the highest accuracy for detection of ureteroliths (78%) and ureteral obstruction (79%). The combination of U-CT and US had the highest sensitivity (96.5%) and negative predictive value (NPV, 96%) for the detection of ureteroliths; however, U-CT alone had the highest specificity (85.5%) and positive predictive value (PPV, 86%). The combination of U-CT and US had the highest sensitivity (96%) and NPV (96.5%) for the detection of obstruction, but was only slightly higher than U-CT alone (sensitivity 92.5%, NPV 93.5%). US alone had the highest specificity (76.5%) and PPV (65.5%) for obstruction, but had the same accuracy for obstruction as U-CT (79% for both). For obstruction detection, the addition of CE-CT did not improve the sensitivity or NPV, and diminished the specificity, PPV and accuracy of detection of obstruction.

Discussion/Conclusion: U-CT had the greatest accuracy for detection of ureteroliths and ureteral obstruction. CE-CT did not improve the diagnostic accuracy for the detection of ureteroliths or ureteral obstruction in cats. With the increased risk of intravenous iodinated contrast administration in an azotemic patient, the inclusion of CE-CT is not indicated for detection of collecting system obstruction from ureterolithiasis.
Saturday, October 20, 2012 – Radiation Oncology

7:00 am  Registration Opens  Registration Desk 1, Office A

8:00 am  RO/VCS Joint Keynote Address  Milan 1, 2, 3, 6
A Dog’s Life: What Can Animals Teach Us About Cancer?
Dr. Bruce Chabner, MD, PhD
Massachusetts General Hospital

VRTOG/RO Scientific Session 1  Modena 1 - 3
(Moderator: Dr. Sheri Siegel)

9:15 am  FIRST PATIENT COHORT OF FELINE FIBROSARCOMAS TREATED WITH CURATIVE INTENT RADIOTHERAPY AT THE UNIVERSITY OF VETERINARY MEDICINE VIENNA. M. Kleiter M, I.T. Fiola, I. Flickinger, S. Kosik, A. Tichy, B. Wollesberger. Department for Companion Animals and Horses and Department for Biomedical Sciences, University of Veterinary Medicine Vienna, Vienna, 1210, Austria.


9:45 am  DOSE VOLUME COMPARISON OF INTENSITY MODULATED RADIATION THERAPY AND 3D PLANNING FOR CRANIAL MEDIASTINAL TUMORS IN DOGS. N.J. Rancilio, S.P. Srivastava, J.M. Poulson. Department of Veterinary Clinical Sciences, Purdue University College of Veterinary Medicine, West Lafayette, IN 47907.

10:00 am  Break with Exhibitors  Molise

VRTOG/RO Scientific Session 2  Modena 1 - 3
(Moderator: Dr. Sheri Siegel)

10:30 am  ELECTRONIC BRACHYTHERAPY FOR THE TREATMENT OF NASAL TUMORS IN 14 DOGS AND 5 CATS. D.J. Marino, Long Island Veterinary Specialists, New York, 11803.


11:00 am  DOSE TOLERANCE LIMITS FOR STEREOTACTIC BODY RADIOTHERAPY IN THE DOG PELVIS. M.W. Nolan, E.J. Ehrhart, H. Yoshikawa, T. Wasserman, S.M. LaRue. Colorado State University, Fort Collins, CO 80523.

11:15 am  SURPRISING BLOODWORK RESULTS FOLLOWING TREATMENT OF 90 HYPERTHYROID CATS WITH RADIOACTIVE IODINE-131 (131I). E.W. Boshoven, TS Conway. VCA Veterinary Referral Associates, Gaithersburg, Maryland 20877.

11:45 am  Lunch on Your Own

1:00 pm  RO Business Meeting  Modena 1 - 3

2:00 pm  Break with Exhibitors  Molise

3:30 pm  ACVR Business Meeting (Diplomates Only)  Milan 4, 5, 7, 8

5:00 pm  Adjourn for the Day

7:00 pm - 10:00 pm  VCS Awards Reception  Palms Resort (Offsite)
FIRST PATIENT COHORT OF FELINE FIBROSARCOMAS TREATED WITH CURATIVE INTENT RADIOTHERAPY AT THE UNIVERSITY OF VETERINARY MEDICINE VIENNA.

Department for Companion Animals and Horses and Department for Biomedical Sciences, University of Veterinary Medicine Vienna, Vienna, 1210, Austria.

Introduction/Purpose: Feline fibrosarcomas at injection sites are locally invasive neoplasms which remain a therapeutic challenge despite aggressive treatment strategies. Pre- or postoperative radiotherapy is an important treatment option in these patients. Its implementation into multimodality therapy became available more recently in Europe. At the University of Veterinary Medicine Vienna a linear accelerator was installed in 2006. The aim of this study was to analyse the first patient cohort treated at this institution retrospectively.

Methods: Cats with soft tissue sarcomas at injection sites which received radiotherapy with a curative intent between January 2006 and June 2010 were included into this study. Medical records of patients were reviewed and patient characteristics, tumor location, treatment protocols and adjuvant therapies were recorded. Follow-up information was obtained from medical records and by phone conversations with referring veterinarians and pet owners.

Results: Thirty nine cats were included into the study. Mean age was 10.3 years and domestic short hair cats were the most common breed (n=33). Radiotherapy was given on a Monday-Friday schedule with a fraction size of 3.2-3.5 Gray (Gy) and a total dose of 48-56 Gy. Twenty six cats (67%) suffered from recurrent disease and 13 animals were presented with multiple recurrences (range 1-5). Preoperative radiotherapy was performed in 14 cats. Adjuvant chemotherapy was given in 8 animals. During the follow-up period 14 patients received further therapies due to local relapse. At the end of the study 28 cats were dead with 12 cats being euthanized due to tumor progression. Median overall survival time was 696 days and median tumor specific survival time was 1685 days.

Discussion/Conclusion: Radiotherapy was generally accepted as new treatment modality by pet owners and referring veterinarians. However, the high number of cats receiving radiotherapy for recurrent disease demonstrates that further information for referring practitioners is needed. We hypothesize that outcome could be further improved if patients that cannot be controlled with surgery alone are treated first line with a multimodality therapy approach.
TREATMENT SETUP AND PHYSICAL CONSIDERATIONS FOR CANINE TOTAL BODY IRRADIATION.

Introduction/Purpose: Total body irradiation (TBI) is commonly performed in people as a component of bone marrow transplantation, but is performed only rarely in the dog. Our purpose is to describe the physics and technique involved in the setup of canine patients for total body irradiation as a component of bone marrow transplantation for treatment of multicentric lymphoma.

Methods: Because it is necessary to expose the entire body in a single field, the patient is positioned in sternal recumbency and treated at an extended distance with a horizontally-directed beam and a large field. The isocenter is positioned at the midplane of the patient. Tissue equivalent material is used to compensate for differences in patient thickness and to provide superficial bolus. Parallel opposed fields are used to maximize dose homogeneity.

Results: We found that a distance of 338 cm is adequate for exposing the entire body of all dogs treated to date in a single field. A standard collimator setting of 40cm x 40cm is always used. Solid water is used as the tissue equivalent material to create a subject (the patient) of uniform thickness. Care is taken to assure that a thickness of tissue equivalent material of at least 1cm covers the thickest part of the patient to act as bolus, allowing the skin to receive the prescribed dose. The surface area of the patient is estimated by making craniocaudal and dorsoventral measurements of the body/tissue equivalent material construct. The use of different field and collimator sizes is important to recognize when correction factors for collimator and field scatter are selected. The dose rate used is 7cGy/min, to protect the gastrointestinal mucosa from denudement. The prescribed dose is divided between left and right fields. The patient is turned end-for-end and the bolus construct reconfigured for the contralateral field.

Discussion/Conclusion: Using this technique it is possible to deliver a midline dose of 3Gy in approximately 30 minutes per field. The overall dose homogeneity along the body axis is within ±10% of the prescribed dose, as verified by initial phantom and chamber dosimetry. Based on hematologic response of patients treated to date, marrow ablation is achieved consistently. This simple method is adequate for incorporation of TBI in protocols for the treatment of canine lymphoid malignancies that include bone marrow transplant.
DOSE VOLUME COMPARISON OF INTENSITY MODULATED RADIATION THERAPY AND 3D PLANNING FOR CRANIAL MEDIASTINAL TUMORS IN DOGS.
N.J. Rancilio, S.P. Srivastava, J.M. Poulson. Department of Veterinary Clinical Sciences, Purdue University College of Veterinary Medicine, West Lafayette, IN 47907.

Introduction/Purpose: Cranial mediastinal tumors are often not surgically resectable and are commonly treated with radiation therapy. Common tumors associated with this region are radiosensitive and include thymoma, lymphoma, and heart-based chemodectoma. CT-based three-dimensional (3D) radiation treatment planning has significantly improved our ability to spare the normal organs at risk in the treated volume compared with simple manual treatment plans. Over the last decade intensity modulated radiation therapy (IMRT) has become increasingly available in veterinary medicine and allows for even more conformal dose distribution and normal tissue sparing. IMRT may be particularly advantageous in the treatment of cranial mediastinal tumors. Lung is the dose limiting normal organ in the thorax, and is particularly sensitive to volume effects. Many patients with cranial mediastinal tumors are presented with large tumors which compress a significant volume of normal lung. Sparing as much normal lung as possible will minimize the probability of radiation pneumonitis and lung fibrosis, which may in turn allow for dose escalation to the tumor volume.

Methods: The Purdue picture archiving server (PACS) was searched for thoracic computed tomography scans in dogs with a cranial mediastinal mass during the past eight years. CT Scans were imported into three-dimensional treatment planning software, contoured, and planned. A dose of 2000 cGy delivered in five 400cGy fractions was prescribed in all cases. Dose volume histograms were generated for each plan and compared. Organs at risk were defined as spinal cord, esophagus, right lung, left lung, total lung volume, and heart. Mean planning target volume (PTV), and gross tumor volume (GTV) dose coverage between plans were also compared.

Results: 5 dogs with cranial mediastinal masses were identified. Tumor types included epithelial neoplasm, thymoma, and chemodectoma (3). In each plan dose coverage for PTV and GTV was at least 90% of the prescribed dose for IMRT and 3D Plans. Evaluation of dose volume histograms for total lung volume revealed reductions in dose to structure volume between 10% and 32% for the 1800 cGy isodose line when IMRT plans were compared to 3D plans (4 of 5 cases). Dose volume histograms for right lung revealed reductions in dose to structure volume between 18% and 32% for the 1800cGy isodose line when IMRT plans were compared to 3D plans (4 of 5 cases). Dose volume histograms for left lung revealed reductions in dose to structure volume between 24% and 37% at the 1800cGy isodose line for IMRT compared to 3D plans (2 of 5 cases). Dose volume histograms for heart, esophagus, and spinal cord were also evaluated and were equivalent between IMRT and 3D plans in most cases.

Discussion/Conclusion: Computer generated IMRT plans for cranial mediastinal tumors demonstrate larger dose sparing to normal lung when compared to simple 3D plans. Prospective studies comparing outcomes in patients treated with IMRT and 3D plans in the cranial mediastinum are needed to demonstrate clinical benefit.
ELECTRONIC BRACHYTHERAPY FOR THE TREATMENT OF NASAL TUMORS IN 14 DOGS AND 5 CATS.
D.J. Marino, Long Island Veterinary Specialists, New York, 11803.

Introduction/Purpose: The electronic brachytherapy (EB) system utilizes an electronic 50 kilo-voltage x-ray source without the drawbacks of an iridium-192 HDR source. The EB system consists of a controller, and a miniaturized x-ray tube that is inserted into the balloon catheter or a treatment cannula. This radiation therapy modality delivers X-rays to the planning tumor volume with an output approximating 1Gy/min at 1cm from the source, reducing the radiation load to normal tissue while shortening the therapy time. The purpose of this study is to describe the use of EB in veterinary patients with nasal tumors, report on the survival times and incidence of acute and late complications in this group of dogs and cats.

Methods: 14 dogs and 5 cats with nasal tumors treated with EB with a median total radiation dose of 45Gy delivered in twice daily 3Gy fractions over 4-8 days. A CT study was performed for EB planning using Brachyvision planning software. No cytoreductive surgery was performed or chemotherapy used. Signalment, tumor type, tumor location, radiation dose, treatment fraction schedule, and acute and late complications Based on the Veterinary Radiation Therapy Oncology Group (VRTOG), and survival were recorded.

Results: Adenocarcinoma (n=6), carcinoma (n=5), sarcoma (n=2), and histiocytic sarcoma (n=1) were found in 14 dogs and lymphosarcoma (n=2) and squamous cell carcinoma (n=1), fibrosarcoma (n=1), and osteosarcoma (n=1) in 5 cats. The median acute biologic effective dose (BEDacute) and median late biologic effective dose (BEDlate) were 62.4Gy and 120Gy respectively. The overall median survival times were 14 months for adenocarcinoma, 5.6 months for carcinoma, 9 months for sarcoma, and 3.5 months histiocytic sarcoma. Grade 0 and 1 (n=18) and grade 3 (n=1) acute skin toxicities were seen with no acute oral or ocular toxicities noted. Grade 0 and 1 (n=10), grade 2 (n=7), and grade 3 (n=1) late skin toxicities were seen with no late oral or ocular toxicities noted.

Discussion/Conclusion: These findings suggest the EB system can be safely used in veterinary patients with nasal tumors to deliver radiation doses in twice daily fractions over 3 to 8 eight days. Although the case numbers are low, survival results are similar to those in previously published reports of nasal tumor patients treated with radiation therapy alone, indicating tumor control was acceptable. Early radiation “drop off” associated with the EB system results in less opportunity for toxicity to surrounding tissues without the construction costs associated with elaborate shielding associated with teletherapy.
ERECTILE DYSFUNCTION FOLLOWING RADIATION THERAPY: A CANINE MODEL.

Introduction/Purpose: Erectile dysfunction (ED) occurs in 36-59% of men having received radiation therapy for prostate cancer. The etiopathology of radiation-induced ED (RI-ED) is poorly understood. Purported mechanisms include cavernosal, arteriogenic and neurogenic injuries. Radiation dose to the posterolateral prostatic neurovascular bundles (NVB) and penile bulb (PB) have been associated with RI-ED. This abstract describes a canine model that has been developed to study the pathogenesis of RI-ED. The model will be used to define field areas associated with presence or absence of RI-ED, and define the mechanisms leading to ED by correlating the incidence of ED following irradiation of specific anatomic locations with changes in perfusion, diffusion and innervation.

Methods: Stereotactic body radiotherapy (SBRT) was used to irradiate the prostate gland, NVB and PB of purpose-bred, intact male dogs. Manual evaluation was used to characterize erectile function and quality. B-mode and Doppler ultrasound of the internal pudendal arteries, prostate and penis, diffusion-weighted and dynamic contrast MRI of the NVB and prostate, and electrophysiology of sensory and motor nerves as well as muscle were performed before and after irradiation. Results of these assays were compared with results of physical evaluations to identify non-invasive functional assays to quantify arteriogenic and neurogenic changes associated with incidence of RI-ED. Gross necropsy and histopathology was also performed.

Results: Erectile dysfunction was a repeatable finding, as documented via subjective and objective manual evaluations following irradiation. Physical changes in erectile function correlated with vascular and neurogenic changes. Dogs with RI-ED are found to have an increased mean time to enhancement of the prostate, longer systolic rise times in the pudendal artery following papaverine injection, abnormal spontaneous EMG activity in the bulbocavernosus muscle, and faster pudendal nerve motor conduction velocities.

Discussion/Conclusion: ED occurs following SBRT in dogs. Measurable endpoints have been developed for evaluation of ED that should help elucidate the etiopathologic processes underlying RI-ED.
DOSE TOLERANCE LIMITS FOR STEREOTACTIC BODY RADIOTHERAPY IN THE DOG PELVIS.
M.W. Nolan, E.J. Ehrhart, H. Yoshikawa, T. Wasserman, S.M. LaRue.

Introduction/Purpose: Stereotactic body radiotherapy (SBRT) is an emerging means for treating pelvic tumors in humans and various veterinary species. The objective of this prospective study was to describe the dose-response relationship and time-dependency of late radiation-induced colorectal complications following SBRT in the dog.

Methods: Nineteen one-year intact male mixed breed hounds were irradiated with one of four different dose/fractionation schemes (50 Gy over either 5 or 11 days, 40 Gy over 11 days, or 30 Gy over 11 days, all in 10 Gy fractions). Treatment volumes included the prostate plus a margin of five millimeters. Subjects were monitored for signs of colorectal toxicosis for up to one year following irradiation. Follow-up examinations included regular physical examinations, periodic non-invasive imaging, as well as fecal examinations and bloodwork (performed on an as-needed basis). Gross necropsy and histopathology were performed upon euthanasia. All toxicoses were graded according to the RTOG criteria for gastrointestinal toxicity.

Results: The severity of colorectal toxicity is lessened with increased interfraction interval. The incidence of severe colorectal toxicity is lower when interfraction interval is prolonged. There is a clear relationship between total dose and risk and severity of colorectal toxicity. In this population of dogs, dose-volume histogram parameters did not predict the likelihood or grade of colorectal toxicity, nor did they vary with duration of interfraction interval.

Discussion/Conclusion: Severe gastrointestinal complications occur less frequently when interfraction intervals are at least 48 hours. The mechanism for this time-dependency is unclear, but likely related to completeness of epithelial regeneration.
SURPRISING BLOODWORK RESULTS FOLLOWING TREATMENT OF 90 HYPERTHYROID CATS WITH RADIOACTIVE IODINE-131 (\(^{131}\)I).
EW Boshoven, TS Conway. VCA Veterinary Referral Associates, Gaithersburg, Maryland 20877.

**Introduction/Purpose:** Radioactive iodine-131 (\(^{131}\)I) has long been used for the treatment of patients with hyperthyroidism. Little information is available pertaining to the outcome of such treatments in cats. In an effort to expand this knowledge, bloodwork was obtained at three weeks and three months following \(^{131}\)I treatment of hyperthyroidism in 90 cats.

**Methods:** To date, 90 cats have been injected with \(^{131}\)I for the treatment of hyperthyroidism at our facility. The dose of \(^{131}\)I was determined based on a combination of the peak total T4 (TT4), the response to methimazole (if given) and blood urea nitrogen (BUN), serum creatinine (Cr) and urine specific gravity levels. Nuclear imaging was not available for any patient. Bloodwork was performed at approximately three weeks and three months following \(^{131}\)I injection by our hospital or the referring veterinarian. \(^{131}\)I was provided by a commercial nuclear pharmacy and arrived pre-calibrated.

**Results:** To date, 73 patients treated with \(^{131}\)I were rechecked at three weeks post \(^{131}\)I injection, 56 patients were rechecked three months post \(^{131}\)I injection and 48 patients have been evaluated at both three weeks and three months post \(^{131}\)I injection. At three weeks, 37 patients (51%) were hypothyroid (TT4 < 1.0µg/dl), 30 (41%) were euthyroid (TT4 1.0µg/dl – 4.0µg/dl) and six (8%) were hyperthyroid (TT4 > 4.0µg/dl). At three months, 20 of 56 were hypothyroid (36%), 33 were euthyroid (59%) and three were hyperthyroid (5%). Of the 20 hypothyroid cats at the three month point, fourteen (70%) were hypothyroid at the three week point, one was hyperthyroid (5%) and five (26%) were euthyroid. Of the three cats that were hyperthyroid at the three month point, one (33%) was hyperthyroid at three weeks, one (33%) was euthyroid and one (33%) did not have blood drawn at three weeks.

The average pre-treatment TT4 for cats that became hypothyroid at three months following treatment was 9.6µg/dl (median 9.1, range 2.5-20). These cats received an average dose of 4.1mCi (median 4.0, range 3.5-5.5) of \(^{131}\)I. They were diagnosed as hyperthyroid for an average of 108 days prior to treatment (median 52, range 5-780). The average pre-treatment TT4 for cats that were still hyperthyroid at three months following \(^{131}\)I treatment was 11.3µg/dl (median 13.4, range 6.9-13.7). They received an average dose of 4.5mCi (median 4.5, range 4-5). These cats were diagnosed as hyperthyroid for an average of 428 days (median 367, range 17-901) prior to treatment with \(^{131}\)I.

**Discussion/Conclusion:** Follow-up after \(^{131}\)I injection is important to determine the efficacy and possible adverse outcomes such as iatrogenic hypothyroidism or persistent hyperthyroidism. Additional means of determining the ideal \(^{131}\)I dose may improve our ability to achieve euthyroidism and avoid iatrogenic hypothyroidism or persistent hyperthyroidism.
CAN WE COLLABORATE SUCCESSFULLY?  A MULTI-CENTER VRTOG STUDY EXAMINING THE EFFICACY OF TOCERANIB PHOSPHATE (PALLADIA®) AS A PRIMARY AND/OR ADJUVANT AGENT IN THE TREATMENT OF CANINE NASAL CARCINOMA.

Introduction/Purpose: A VRTOG study was started in October of 2010 to identify the activity of toceranib phosphate alone or as a radiation-sensitizing agent in the treatment of canine nasal carcinoma. This was the VRTOG’s first attempt to collaborate on a large-scale, prospective study.

Methods: Data collection forms are completed by the radiation oncologist on site and submitted to a single appointed investigator for review. These forms act as invoices for disbursement of study funds from the ACVR treasurer. This study is funded by a grant from Pfizer.

Results: At this time, 43 of the intended 60 patients are enrolled from 10 separate study sites. Length of enrollment ranges from 1 to 86 weeks at the time of submission. 33 of 45 patients are enrolled with intent to treat in the radiation and toceranib phosphate arm of the study at this time. 10 patients have been withdrawn due to progression of disease documented with computed tomography or by recurrence of clinical signs (7), for unacceptable side effects (2) and for other reasons (1). At time of submission, 18 patients have completed the radiation portion of the protocol and reached the computed tomography scan repeated at week 16 to document response to therapy. There are 2 documented complete responses, 13 partial responses and 3 patients with stable disease. No patients within this arm of the study had progressive disease at the time of the repeated CT.

11 of 15 patients are enrolled with intent to treat in the toceranib phosphate alone arm. 4 have been withdrawn either for progression of disease (2) or for unacceptable side effects (2). The toceranib phosphate alone arm has 4 patients that have had a repeated computed tomography scan. No patients have had complete responses, 1 patient had a partial response, 1 patient had stable disease and 2 patients had progressive disease. This data is continuing to mature and we will compare these patients’ response to an age, gender and breed matched cohort of historical controls once data accumulation is complete. We hope to have all cases entered by the end of 2012.

Discussion/Conclusion: This format has allowed timely case accrual with minimal time commitment from individual sites but does require a single investigator dedicated to the project for management and oversight. The VRTOG appears to be a viable entity in which randomized clinical trials can be performed accurately and in a timely fashion allowing the accrual of larger numbers of patients from a broad geographical cross-section.
Sunday, October 21, 2012

7:00 am  Registration Opens
           Registration Desk 1, Office A
           and CE Certificates Available

7:30 am  CT/MRI Society Meeting
           Milan 4, 5, 7, 8

8:00 am  CT/MRI Keynote Address
           Milan 4, 5, 7, 8
           CT Angiography
           Dr. Geoffrey Rubin
           Duke University Medical Center

CT/MRI Scientific Session 6
(Moderator: Dr. Shannon Holmes)

9:00 am  COMPUTED TOMOGRAPHIC IMAGING CHARACTERISTICS OF CANINE
          ODONTOGENIC TUMORS.  J.T. Amory, J.A. Reetz, C.W. Bradley, M.D. Sanchez,
          J.R. Lewis, W. Mai. University of Pennsylvania School of Veterinary Medicine,
          Philadelphia, PA 19104.

9:12 am  DIFFERENTIATING NASAL CHONDROSARCOMA FROM NASAL
          ADENOCARCINOMA ON COMPUTED TOMOGRAPHY.  M.J. Enroth, A.J. Marolf,
          A. Valdes-Martinez, E.K. Randall. Colorado State University, Colorado, 80523

9:24 am  CT APPEARANCE AND VASCULAR CHARACTERISTICS OF LIVER MASSES IN
          DOGS.  K. Phillips1, J.M. Cullen1, T. Van Winkle2, C. Arellano1, W. Mai2, G. Seiler1.
          1North Carolina State University, NC, 27607 and 2University of Pennsylvania, PA,
          19104.

9:36 am  LIVER-SPECIFIC CONTRAST AGENT Gd-EOB-DTPA FOR MAGNETIC
          RESONANCE IMAGING OF CANINE FOCAL LIVER LESIONS.  D. Yo
          Netomi, T. Nakade. Rakuno Gakuen University, Betsu, Hokkaido, 069-8501.

9:48 am  DYNAMIC SECRETIN-ENHANCED MAGNETIC RESONANCE CHOLANGIO-
          PANCREATOGRAPHY AND PANCREATIC ULTRASONOGRAPHY IN NORMAL
          DOGS.  J.Y. Heo, P.D. Constable, J.F. Naughton. Purdue University, College of
          Veterinary Medicine, IN, 47907.

10:00 am Break with Exhibitors
         Molise

CT/MRI Scientific Session 7
(Moderator: Dr. Anthony Fischetti)

10:30 am MAGNETIC RESONANCE IMAGING (MRI) OF THE SPINE IN SMALL ANIMALS –
         EVALUATION OF SEQUENCES AND PROTOCOL RECOMMENDATIONS.  A.C.
         Fonseca Pinto1, S. Hecht2. 1University of São Paulo, São Paulo, SP, 05508-900,
         Brazil; 2University of Tennessee College of Veterinary Medicine, Knoxville, TN
         37996.
10:42 am  MRI SIGNS OF INCREASED INTRACRANIAL PRESSURE IN DOGS. S. Bittermann\textsuperscript{1}, D. Henke\textsuperscript{2}, J. Lang\textsuperscript{1}, D. Gorgas\textsuperscript{1}. Department of Clinical Veterinary Medicine, Division of \textsuperscript{1}Clinical Radiology and \textsuperscript{2}Neurology, Vetsuisse Faculty Bern, 3012 Bern, Switzerland.


11:06 am  MAGNETIC RESONANCE IMAGING (MRI) OF THE LIVER IN NORMAL DOGS USING THE SPECIFIC CONTRAST AGENT EOVIST®. A. Marks, S. Hecht, J. Stokes, G. Conklin, K. DeAnna. Department of Small Animal Clinical Sciences, University of Tennessee College of Veterinary Medicine, Knoxville, TN, USA.

11:18 am  ABDOMINAL MRI AND MRCP FINDINGS IN CATS WITH PANCREATITIS AND CHOLANGITIS/HEPATITIS. AJ Marolf\textsuperscript{1}, SL Kraft\textsuperscript{1}, TR Dunphy\textsuperscript{2}, D Twedt\textsuperscript{1}, Colorado State University\textsuperscript{1}, Advanced Imaging Consultants\textsuperscript{2}, Fort Collins, Colorado, 80523.

11:30 am  MAGNETIC RESONANCE IMAGING (MRI) OF THE CENTRAL NERVOUS SYSTEM IN LARGE FELIDS. S. Hecht, E.C. Ramsay, J. Schumacher, W.B. Thomas, W.H. Adams, G.A. Conklin. Department of Small Animal Clinical Sciences, University of Tennessee College of Veterinary Medicine, Knoxville, TN, USA.

11:42 am  DIAGNOSTIC IMAGING ENHANCEMENT MANAGEMENT OF ACUTE RESPIRATORY DISTRESS SYNDROME. T.J. Oura\textsuperscript{1}, R.M. Hanel\textsuperscript{1}, J. Davies\textsuperscript{2}, I.D. Robertson\textsuperscript{1}, D.E. Thrall\textsuperscript{1}, G.S. Seiler\textsuperscript{1}, N. MacIntyre\textsuperscript{2}. North Carolina State University College of Veterinary Medicine, Raleigh, NC, 27607 and \textsuperscript{2}Duke University Medical Center, Durham, NC, 27705.

12:00 pm  Lunch on Your Own

1:00 pm  Topics in Equine Imaging  
            Milan 4, 5, 7, 8

1:00 pm  Equine Dental Radiology  
            Dr. Sarah Pulchalski

1:30 pm  Clinical and Research Applications of CT in Equine Imaging  
            Dr. Sarah Pulchalski

2:00 pm  dGEMERIC and T2 Mapping for Evaluation of Equine Articular Cartilage  
            Dr. Anthony Pease

2:30 pm  Selection of Anatomic Regions for MR Examination Based on Blocking Patterns  
            Dr. Natasha Werpy

3:00 pm  Break with Exhibitors  
            Molise
Large Animal Scientific Session 8  
(Moderator: Dr. Lorrie Gaschen)

3:30 pm  
DETECTION OF FRACTURES OF THE PALMAR PROCESSES OF THE DISTAL PHALANX IN FOALS. B. Faramarzi¹, S. Halland¹, H. Dobson². ¹Western University of Health Sciences College of Veterinary Medicine, 309 E. 2nd St. Pomona, CA, USA 91766 and ²Department of Clinical Studies, Ontario Veterinary College, University of Guelph, Guelph, Ontario.

3:42 pm  

3:54 pm  

4:06 pm  

4:18 pm  
ULTRASONOGRAPHIC APPEARANCE OF NORMAL AND INJURED LATERAL PATELLAR LIGAMENTS IN THE EQUINE STIFLE. R. Kaplan¹, M.B. Whitcomb², B. Vaughan², L.D. Galuppo², M. Spriet². ¹William R Pritchard Veterinary Medical Teaching Hospital and ²Department of Surgical & Radiological Sciences, University of California, Davis, 95616.

4:30 pm  
Meeting Concludes
COMPUTED TOMOGRAPHIC IMAGING CHARACTERISTICS OF CANINE ODONTOGENIC TUMORS.


Introduction/Purpose: Information regarding the imaging characteristics of canine odontogenic tumors (COT) is limited. Computed tomography (CT) is frequently used to assess oral neoplasia in small animal patients. The purpose of this study was to investigate the CT imaging features of COT.

Methods: Medical records were searched between 2002 and 2012 for all dogs that underwent CT and had a confirmed histopathologic diagnosis of COT. A board-certified radiologist blindly reviewed all CT studies. A board-certified pathologist reviewed all biopsy samples. CT criteria recorded included tumor location, tooth involvement, bone lysis, bone production, bone expansion, cyst-like changes, extra-oral lesion invasion, contrast enhancement, transverse diameter, and lymphadenopathy.

Results: Twenty-three dogs were included in this study: 14 canine acanthomatous ameloblastoma (CAA), 2 amyloid-producing odontogenic tumors, 2 keratinizing ameloblastomas, 1 compound odontoma, 1 ameloblastic fibroma, 1 ameloblastic fibro-odontoma, 1 fibromatosus epulis of periodontal ligament origin (FEPLO), and 1 odontogenic squamous epithelial tumor with features of an odontogenic ghost cell tumor. Compared to the pool of 438 dogs with oral neoplasms presented to the VHUP dentistry service over the same period of time, CAA was significantly over-represented in the CT group (P=0.014) while FEPLO were significantly under-represented (P<0.001) in the CT group. Of COT with CT examinations, mandibular masses (n=5) were significantly under-represented (P=0.026). Masses were associated with teeth in 95.7% (22/23) of patients, involving multiple teeth in 87% (20/23) and centered at a specific tooth in only 8.7% (2/23) of individuals. Masses were primarily soft tissue attenuation in 43.5% (10/23) and contained regions of soft tissue and mineral attenuation in 56.5% (13/23). Alveolar bone lysis was observed in 95.7% (22/23) and extended beyond the alveolar margins in 69.6% (16/23). Bone expansion was observed in 65.2% (15/23), and cortical bone lysis was observed in 91.3% (21/23). Mass extension into extra-oral structures occurred with 55.6% (10/18) of maxillary masses. In all 22 cases where post contrast series were acquired, there was contrast-enhancement that was heterogeneous in 90.9% (20/22). Mass associated cyst-like structures were observed in 56.5% (13/23). Mandibular lymphadenopathy was observed in 81% (17/21) and medial retropharyngeal lymphadenopathy in 33.3% (7/21).

Discussion/Conclusion: In our population, FEPLO and mandibular COT are rarely referred for CT examinations. Imaging findings with COT are variable but tooth association, alveolar and cortical bone lysis, and heterogeneous contrast enhancement are very common, while expansile appearance and cyst-like components are fairly common characteristics.
DIFFERENTIATING NASAL CHONDROSARCOMA FROM NASAL ADENOCARCINOMA ON COMPUTED TOMOGRAPHY.

Introduction/Purpose: The most common type of nasal tumor in the dog is nasal adenocarcinoma, representing approximately 60% of nasal tumors. Nasal chondrosarcoma is the most common non-epithelial nasal tumor diagnosed in dogs. In veterinary medicine, no definitive criteria have been consistently identified on CT examination to differentiate nasal adenocarcinoma and nasal chondrosarcoma. The purposes of this retrospective study were to: 1) determine if nasal chondrosarcoma was more likely to have internal mineralization than adenocarcinoma 2) evaluate any other unique CT features of nasal chondrosarcoma versus nasal adenocarcinoma to aid in tumor diagnosis.

Methods: Computed tomographic images of 43 dogs with either nasal chondrosarcoma (n=18) or adenocarcinoma (n=25) were evaluated by three board certified radiologists. Criteria evaluated included: nasal cavity involvement, nasal cavity occlusion, sinus involvement, nasal septum lysis or deviation, nasal turbinate lysis, cribiform plate lysis, hard palate lysis, bony and soft tissue expansion, and destruction or alteration of other surrounding bony structures. Additionally evaluated were homogeneity of the mass, contrast enhancement, internal mineralization of the mass and surrounding tissues, and lymph node involvement. Analysis of cross-classification of potential predictors of nasal chondrosarcoma and nasal adenocarcinoma and Fisher's exact test were performed. P-values of 0.05 or less were considered significant.

Results: In patients with bilateral nasal cavity involvement, bilateral full nasal cavity occlusion was present in 58%(7/12) of chondrosarcoma cases and 11.11%(2/18) cases of adenocarcinoma. Those with both nasal cavities fully occluded were more likely to have chondrosarcoma (p=0.0125). In patients with bilateral nasal cavity involvement, those with one fully occluded nasal cavity occurred in 33.33%(4/12) cases of chondrosarcoma and 66.67%(12/18) cases of adenocarcinoma. Bony expansion and destruction of bone was present in 16%(4/25) of adenocarcinomas and in 38.89%(7/18) of chondrosarcomas. Among tumors with bony expansion present, there were almost twice as many nasal chondrosarcomas as nasal adenocarcinomas. Chondrosarcoma more commonly had internal mineralization. Heterogeneous attenuation of the mass was found in 48%(12/25) of adenocarcinoma cases and 77.78%(14/18) of chondrosarcoma cases (p=0.0637). Among those with homogenous attenuation, there were more than three times as many adenocarcinoma as chondrosarcoma.

Discussion/Conclusion: When comparing CT characteristics of nasal adenocarcinoma versus nasal chondrosarcoma, only weak statistically significant differences were identified. Those tumors with internal mineralization, bony expansion, and bilateral full nasal cavity occlusion were more likely to be chondrosarcoma. Those tumors that were homogeneously attenuating were more likely to be adenocarcinoma. Both tumor types need to be considered as possible differentials when nasal tumors are identified on CT examination.
CT APPEARANCE AND VASCULAR CHARACTERISTICS OF LIVER MASSES IN DOGS.
K. Phillips1, J.M. Cullen1, T. Van Winkle2, C. Arellano1, W. Mai2, G. Seiler1. 1North Carolina State University, NC, 27607 and 2University of Pennsylvania, PA, 19104.

Introduction/Purpose: Multiphase CT is being successfully used to diagnose several types of liver masses in human medicine. This is largely due to the neovascularization of malignant neoplasms that can be detected as increased arterial blood supply compared to benign lesions. The purpose of this study was to determine specific CT findings, particularly contrast enhancement patterns during different vascular phases that would differentiate between common types of liver masses in dogs.

Methods: This study included dogs that had a contrast enhanced CT of a liver mass with a histopathologic diagnosis. All biopsies were reviewed by two pathologists specializing in liver disease. Images were evaluated for morphologic criteria; including size of hepatic lymph nodes, central hypoattenuating regions consistent with necrosis and contrast enhancement of each available vascular phase. Regions of interest were drawn around major vessels, normal hepatic parenchyma and through the lesion at its maximum transverse diameter. The CT Hounsfield units during each vascular phase and the difference between arterial and pre-contrast phases were examined by fitting a linear model. Estimated least squares means were obtained and pairwise student t-test were used to compare benign versus malignant lesions and between hepatocellular carcinomas, hepatocellular adenomas and neuroendocrine tumors.

Results: A total of 37 cases met inclusion criteria: 14 hepatocellular carcinomas (HCC), 11 hepatocellular adenomas (HA), 5 neuroendocrine tumors (NE) and 6 masses of other origin. When all of the lesions were grouped as benign versus malignant, no statistically significant differences were found in either morphologic or vascular parameters. The only statistically significant difference in morphologic criteria was neuroendocrine tumors had smaller hepatic lymph nodes than all the other groups (p=0.0006). For the vascular parameters HCC demonstrated a statistically significant increase in arterial contrast enhancement when compared to HA (p=0.024).

Discussion/Conclusion: The morphologic appearance of all the liver masses was very similar in this study and the arterial phase contrast enhancement was unable to determine malignancy when all of the tumor types were included. However the differences in arterial blood flow, between hepatocellular adenomas and carcinomas that this study demonstrated are similar to what is reported in human literature.
LIVER-SPECIFIC CONTRAST AGENT Gd-EOB-DTPA FOR MAGNETIC RESONANCE IMAGING OF CANINE FOCAL LIVER LESIONS.
D. Yonetomi¹, T. Kadosawa¹, K. Miyoshi¹, Y. Nakao¹, E. Homma¹, K. Hanazono¹, A. Ijiri¹, N. Minegishi¹, S. Maetani¹, K. Hirayama², H. Taniyama², T. Nakade¹.
¹Department of Small Animal Clinical Sciences and ²Department of Veterinary Pathology, School of Veterinary Medicine, Rakuno Gakuen University, Ebetsu, Hokkaido 069-0851, Japan

Introduction/Purpose: Gd-EOB-DTPA (EOB-Primovist®) is a new liver-specific contrast agent for MR imaging. Gd-EOB-DTPA accumulates in normally functioning hepatocytes 20 min after injection. As with Gd-DTPA (Magnevist®), it is also possible to perform a dynamic multiphasic examination of the liver with Gd-EOB-DTPA, including an arterial phase and a portal venous phase. Our objective was to determine the appropriate timing for the vascular and parenchymal (hepatobiliary) phases for low-field MR imaging using Gd-EOB-DTPA in normal dogs and to evaluate the patterns of images acquired with this contrast agent in dogs with hepatic masses. Moreover, the usefulness of this contrast agent in differentiating malignant from benign hepatic lesions was also evaluated.

Methods: First, a reliable protocol was developed and the appropriate timings for the dynamic study and the hepatobiliary phase using Gd-EOB-DTPA were determined in 14 normal beagles. Second, the patterns of these images were evaluated in 9 patient dogs with hepatic masses. The signal intensity of the liver lesions was characterized as hyper-, hypo-, or isointense compared to the surrounding normal liver parenchyma. The results of histopathologic examination for each lesion were correlated with the MR signal patterns.

Results: The optimal time of arterial imaging was from 15 s after injection, and the optimal time for portal venous imaging was from 40 s after injection. Meanwhile, the optimal time to observe changes during the hepatobiliary phase was from 20 min after injection. In patient dogs, 11 lesions were diagnosed as malignant tumors; all were hypointense relative to the surrounding normal liver parenchyma during the hepatobiliary phase.

Discussion/Conclusion: MR imaging using Gd-EOB-DTPA can be used to detect canine hepatic benign nodules and malignant tumors with adequate image quality. Even with the low-field MR imaging, the sequences afforded images adequate to visualize the liver parenchyma and to detect tumors within an appropriate scan time. Contrast-enhanced MR imaging with Gd-EOB-DTPA provided good demarcation for low-field MR imaging for diagnosing canine focal liver lesions.
DYNAMIC SECRETIN-ENHANCED MAGNETIC RESONANCE CHOLANGIO-PANCREATOGRAPHY AND PANCREATIC ULTRASONOGRAPHY IN NORMAL DOGS.
J.Y. Heo, P.D. Constable, J.F. Naughton. Purdue University, College of Veterinary Medicine, IN, 47907.

Introduction/Purpose: Secretin-enhanced magnetic resonance cholangio-pancreatography (SMRCP) is a diagnostic imaging method used to visualize the biliary tract and pancreatic duct in humans. SMRCP is commonly used to make a diagnosis of pancreaticobiliary disease in people because it provides a superior non-invasive diagnostic test compared to other conventional diagnostic imaging modalities. The technique may therefore have clinical utility in the diagnosis of pancreaticobiliary disease in dogs. However, there is no known canine MRCP report in the veterinary literature. Accordingly, the main objectives of this study were to identify pancreaticobiliary structures using Single Shot Fast Spin Echo (SSFSE) MRCP and to determine the influence of secretin stimulation on the visibility and diameter of the pancreatic duct on MRCP and ultrasonographic images in dogs.

Methods: Six healthy adult dogs (body weight 17.5kg to 37.1kg) with no known history of pancreatic, hepatobiliary or gastrointestinal diseases were examined. Pre-secretin-enhanced MRCP (PreSMRCP) and dynamic SMRCP using SSFSE and secretin-enhanced pancreatic ultrasonography (SPUS) were performed. Secretin was infused IV over one minute, and images obtained for the following 15 minutes.

Results: On PreSMRCP, the gallbladder was visualized in all six dogs using. The intrahepatic bile ducts were not detected in any dogs. The pancreatic duct in the right limb, body and left limb was seen in one, two and two dogs, respectively. The main pancreatic duct and the accessory duct were seen in only one dog. On SMRCP, the accessory duct was visualized in 53% of the dynamic scans. The pancreatic duct at the right limb, body and left limb and the main pancreatic duct were detected in 32%, 42%, 38% and 18% of the scans, respectively. In SMRCP, the accessory duct diameter was significantly increased (P<0.05) for three minutes after secretin administration, after which time the diameter gradually decreased. The main pancreatic and right limb ducts and body had similar but non-significant increases in their diameter after secretin administration. On SPUS, the diameter of pancreatic duct at the right and left limbs and body was not significantly increased after secretin administration. Average pancreatic duct diameter at the body and left limb was significantly larger on SMRCP (1.11±0.06, 1.03±0.12mm; LSM±SE, P=0.0005) compared to SPUS (0.48±0.05, 0.50±0.08mm, P=0.040), respectively.

Discussion/Conclusion: Biliary ductal structures could be visualized with SSFSE MRCP with the exception of the intrahepatic bile duct. Visualization of the pancreatic ductal structures was limited on MRCP using SSFSE sequences but was moderately enhanced after secretin administration. Additional studies using SMRCP appear indicated in dogs suspected to have pancreaticobiliary disease.
MAGNETIC RESONANCE IMAGING (MRI) OF THE SPINE IN SMALL ANIMALS – EVALUATION OF SEQUENCES AND PROTOCOL RECOMMENDATIONS.
A.C. Fonseca Pinto¹; S. Hecht². ¹University of São Paulo, São Paulo, SP, 05508-900, Brazil; ²University of Tennessee College of Veterinary Medicine, Knoxville, TN 37996, USA.

Introduction/Purpose: Magnetic resonance imaging (MRI) is the gold standard in the evaluation of the nervous system in humans and is increasingly utilized in veterinary medicine. To minimize overall examination time attempts have been made in human medicine to develop MRI protocols with a limited number of specific sequences. The same would be desirable for veterinary medicine. The goal of this research was to determine the most useful MRI sequences to evaluate the spine of dogs in light of clinical findings.

Methods: A retrospective evaluation of 122 MRI studies was performed by two investigators, and a consensus was reached in order to select the 2 sequences that were most helpful in the identification and classification of spinal lesions. Sequences evaluated included sagittal T1-W SE, T2-W FSE, STIR, and when available T2*-W and post contrast T1-W SE with fat saturation (FS). Signalment, history, reason for MR examination and final diagnosis/outcome were recorded for each patient. The studies were divided in three groups according to the onset of signs [acute (AC) 6 - 24h, subacute (SBA) 24h - 1 week and chronic (CR) > 1 week].

Results: The most common breeds in our study population were Dachshund and Labrador Retriever. There was no obvious age or sex predilection. 17.2% of dogs were in the AC group, 15.6% in the SBA group, and the majority (67.2%) in the CR group. The most common clinical sign regardless of group assignment was pain. Loss of the deep pain was more frequent in the AC group. The most frequent finding in each group was extradural lesions (AC 71.4%; SBA 68.4%; CR 61.0%). MRI sequences considered most useful for each group was STIR followed by T2-W in all groups. T2-W and post contrast T1-W sequences showed increasing importance in chronic cases.

Discussion/Conclusion: Based on our study results choice of MRI sequences for evaluation of the canine spine should include the STIR sequence regardless of duration of clinical signs. In patients with chronic signs acquisition of post contrast T1-W images should also be considered.

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MRI SIGNS OF INCREASED INTRACRANIAL PRESSURE IN DOGS.
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Introduction/Purpose: Detection of increased intracranial pressure (IICP) is often based on clinical or imaging findings. Reported imaging signs in dogs are mass effect, hydrocephalus, reduced sulci size and herniation, either foramen magnum herniation (FMH) or caudal transtentorial herniation (CTH). In people, other imaging signs are known to indicate IICP. Aim of this prospective study is the description of MRI signs associated with IICP in dogs.

Methods: 91 dogs presented for MRI examination of the head underwent neurologic examination, fundoscopy and transcranial dopplersonography of the basilar and middle cerebral artery for measurement of resistive index and flow pattern analysis. A scoring based on the results classified dogs as having IICP, or not. Unaware of the scoring, MRI examination was evaluated for presence of any herniation (FMH, CTH, rostral transtentorial, subfalcine and cranium defect herniation), cerebellar shape, position of quadrigeminal plate, size and shape of internal and external CSF spaces and of the interthalamic adhesion, and presence of an empty sella. Additionally, shape of the posterior sclera, optic papilla protrusion, optic nerve diameter and optic nerve sheath diameter were determined. Sensitivity (SE), specificity (SP) and likelihood ratio (LR) were calculated (95%CL). The level of statistical significance was determined to p<0.05.

Results: Eighteen/ 91 dogs were classified as having IICP. With the exception of cranium defect, any type of herniation was associated with IICP (p<0.04), FMH being the most common (19/91; p=0.0358) and subfalcine herniation showing the highest association (p<0.0001). Other shifts of brain parenchyma associated with IICP were flattening of the rostral cerebellar contour (p=0.0005; SE= 55.6%, SP=83.6%, LR= 3.38), caudal transposition of the quadrigeminal plate (p<0.0001; SE=27.8%, SP 98.6%, LR= 20), midline shift (p<0.0001; SE=66.6%, SP=90.0%, LR= 6.67), and deformation of the interthalamic adhesion (p=0.0046; SE= 64.7%, SP=71.8%, LR=2.3). Concerning internal CSF spaces, compression of the 3rd or 4th ventricle was highly specific for IICP (p=0.001; SE 72.2%, SP=87.6%, resp. p=0.0005; SE=35.3%; SP=94.4%), as well as of the suprapineal recess (p<0.0001; SE= 44.4%, SP=98.6%, LR=32.4). Elapsed cerebral sulci indicated IICP (p<0.0001, SE= 61.1%, SP= 94.5%, LR= 11.2). Protrusion of the optic papilla was a rare sign (17/91), but associated with IICP (p=0.0017, SE=44.4%, SP= of 87.7%, LR= 3.6).

Discussion/Conclusion: Since a direct measurement of intracranial pressure is invasive, MRI is an important tool to detect and confirm IICP. A lot more imaging signs than reported are associated with IICP and some of them are highly specific for IICP; however, the sensitivity of the single signs is moderate. In presence of one or a combination of these MRI signs, presence of IICP can be assumed.
MAGNETIC RESONANCE SPECTROSCOPY OF THE AGED CAT BRAIN AND ITS RELATIONSHIP TO COGNITION.

Introduction/Purpose: Cognitive dysfunction syndrome is well recognized in the dog has more recently been described in the cat. The age related dementia in the dog associated with CDS is an established naturally occurring model of Alzheimer’s Disease in people and the magnetic imaging and spectroscopy characteristics have been described. The objective of this imaging study was to explore the relationship between magnetic resonance spectroscopy (MRS) and cognitive function testing in cats.

Methods: Thirty six female short hair domestic cats were used in this study. Subjects were divided into three age categories: Twelve adult (3.04-4.17yr), 12 old (7.96-9.03yr) and 12 senior cats (10.91-15.05yr) female short haired domestic cats were enrolled in the study. Magnetic resonance spectroscopy was performed at 1.5T using the point-resolved spectroscopy (TR = 1500 msec, TE = 30 msec; NEX = 8 ) with a single voxel of 6-8ml was individually fitted into the centre of the cerebrum of each subject, avoiding contamination from either the skull or surrounding muscle. Data were analyzed using the LC Model fitting procedure. Cognitive function was determined using an object discrimination test.

Results: Levels of creatinine, inositol and N-acetyl-aspartate were lowest in the oldest age group. Old, cognitively impaired subjects exhibited lower levels of inositol and N-acetyl-aspartate than non-impaired subjects. Levels of glutamate and glutamine were correlated with cognitive performance in the old and senior groups.

Discussion/Conclusion: The study indicates that MRS can provide biomarkers of cognitive aging in the cat. The findings parallel those identified in both the dog and humans.
MAGNETIC RESONANCE IMAGING (MRI) OF THE LIVER IN NORMAL DOGS USING THE SPECIFIC CONTRAST AGENT EOVIST®.

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Introduction/Purpose: The liver in humans and animals is frequently affected by a variety of diseases requiring the use of different imaging modalities for diagnosis. Gadoxetate disodium (Gd-EOB-DTPA; Eovist®) is a newly developed paramagnetic contrast agent with high specificity for the hepatobiliary system. This contrast agent has proved useful in the diagnosis of focal and diffuse hepatic disease in humans. The purpose of this study was to develop a protocol for the use of Eovist® in dogs and characterize normal liver MR images before and after administration of Eovist® in healthy dogs.

Methods: Abdominal MRI (1.0T Siemens Magnetom Harmony) was performed on eight healthy mature dogs. Pre-contrast sequences performed on all dogs included dorsal and transverse T1-weighted spin echo (T1-W SE) and T2-weighted fast spin echo (T2-W FSE), and transverse volume-interpolated body examination (VIBE; T1-W fat suppressed GRE sequence). Dogs 1, 3, 5, and 7 received one 0.05mL/kg (0.0125mmol/kg) dose of Eovist® and dogs 2, 4, 6, and 8 received one 0.1mL/kg (0.025mmol/kg) dose of Eovist®. The post-contrast sequences of dogs 1, 2, 3, and 4 were transverse VIBE initiated immediately after contrast medium administration followed by transverse VIBE acquired every 5 minutes for 40 minutes, and transverse and dorsal T1-W SE acquired after 40 minutes. The post-contrast sequences of dogs 5, 6, 7, and 8 were transverse T1-W SE acquired immediately and then every 5 minutes for 40 minutes, and transverse and dorsal VIBE acquired after 40 minutes. Signal intensity ratios (SIR) of post-contrast T1-W SE and VIBE, and SIR of ratios between the two dose groups were evaluated using a student’s t-test. A p-value of <0.05 was considered significant.

Results: No adverse effects to contrast medium administration were observed. Contrast enhancement in most dogs peaked between 1 and 10 minutes and plateaued for the remainder of the examination. The post-contrast SIR was significantly higher for the VIBE than the T1-W SE images (p=0.027). There was no significant difference in degree of enhancement between the two contrast dose groups (p=0.603).

Discussion/Conclusion: The administration of Eovist® during MRI examination produces homogenous contrast enhancement of the liver in normal dogs. Peak enhancement occurs early, and a significant parenchymal wash-out phase is not observed during 40 minutes. These results provide a baseline for future studies in dogs with liver disease.

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ABDOMINAL MRI AND MRCP FINDINGS IN CATS WITH PANCREATITIS AND CHOLANGITIS/HEPATITIS.

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Introduction/Purpose: Abdominal magnetic resonance (MR) imaging including MR cholangiopancreatography is considered an accurate, highly sensitive and specific imaging method for assessment of human biliary and pancreatic disorders including biliary tract abnormalities, pancreatitis, and pancreatic tumors. Cholangitis is the second most common liver disease among cats, and often times is associated with pancreatitis. B-mode ultrasound is the currently recommended imaging method to diagnose these conditions in cats but has suboptimal sensitivity and specificity. Cats with suspected cholangitis and/or pancreatitis were enrolled in a prospective clinical trial to evaluate these patients with abdominal MRI including cholangiopancreatography (MRCP).

Methods: Seven cats with clinical signs, blood work, and/or previous abdominal ultrasound findings consistent with cholangitis and/or pancreatitis were enrolled in this prospective study. Cats had blood drawn for hematology, biochemistry profile, fPLI assay, and an abdominal ultrasound scan. An MRI including post secretin assessment was performed, followed by laparoscopic biopsies of the liver and pancreas with cats under general anesthesia. The MRI sequences were evaluated via consensus by two board certified radiologists and compared to the liver and pancreas histology.

Results: Six cats had an abnormal pancreas based on imaging including mild to moderate enlargement of the gland, T1 hypointense and T2 hyperintense parenchyma and a dilated pancreatic duct. 5 of these cats had histologically diagnosed pancreatitis. One of these cats, which shared those same imaging findings, had a histologically normal pancreas. All 6 cats had an abnormal pancreas laparoscopically, and 4 of these cats had a normal fPLI assay. The seventh cat had a normal pancreas on imaging, including normal gland size, T1 hyperintense and T2 hypointense parenchyma¹, and normal pancreatic histology. This cat had a normal pancreas laparoscopically and a normal fPLI assay. All seven cats had histologic evidence of hepatitis or cholangitis; however, after special stains one cat was rediagnosed with hepatic lymphoma. All cats had a hypointense liver on all imaging sequences. 5/7 cats had multifocal cysts or nodules in the liver. 6/7 cats had gallbladder debris, and 2/7 cats had a dilated common bile duct.

Discussion/Conclusion: MRI correctly diagnosed pancreatitis in 5/6 cats and correctly diagnosed a normal pancreas in 1 cat. The 1 cat with an abnormal pancreas based on imaging but normal histology possibly had pancreatitis which may have been missed due to the small, limited biopsy samples. A T1 hypointense, T2 hyperintense, enlarged pancreas with dilated pancreatic duct is consistent with pancreatitis. Liver MRI imaging findings were nonspecific but included cysts, nodules, and biliary abnormalities.

MAGNETIC RESONANCE IMAGING (MRI) OF THE CENTRAL NERVOUS SYSTEM IN LARGE FELIDS.

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Introduction/Purpose: To date, reports describing CNS disorders in large felids and their diagnosis have been limited to a few papers detailing the use of radiographs, myelography and computed tomography (CT). MRI findings have been reported in lions with hypovitaminosis A and in a tiger cub following hypoxic arrest during general anesthesia. To our knowledge, MRI findings in a varied population of large felids with CNS disease have not been reported. The goal of this study was to describe MRI findings in large felids presented to UTVMC with brain or spinal disorders.

Methods: The MRI database was searched for large nondomestic cats in which MRI of the brain or spine was performed. The scans were reviewed. The medical records were evaluated and signalment, history, clinical signs and diagnosis/outcome were recorded.

Results: 14 MRI scans in 13 animals were available for review. All scans were performed using a 1.0T scanner (Siemens Magnetom Harmony). Patients included 5 tigers (Panthera tigris), 4 lions (Panthera leo) and 1 each of cheetah (Acinonyx jubatus), bobcat (Lynx rufus), caracal (Felis caracal), and leopard (Panthera pardus). Median age was 14 years (range, 6 months – 17 years). Areas imaged included the head/brain (n = 11), cervical spine (n = 1) and thoracolumbar spine (n = 2). Six cats are alive at the time of abstract submission, 6 animals had been euthanized. MRI sequences used for evaluation of the head/brain included T2-w, T1-w, fluid attenuated inversion recovery (FLAIR), T2*-w GRE and post contrast T1-w. MRI sequences used for evaluation of the spine included T2-w, T1-w, short tau inversion recovery (STIR), and half-Fourier-acquisition single-shot turbo spin-echo (HASTE). Diagnoses based on imaging findings were severe otitis media and cellulitis without intracranial extension (n = 1), Chiari-type malformation (presumed hypovitaminosis A) (n = 1), hydrocephalus and ependymal contrast enhancement due to intracranial blastomycosis (n = 1), normal brain MR examination (n = 7), and intervertebral disc herniation (n = 3).

Discussion/Conclusion: MRI is feasible in large felids and provides important information in the clinical evaluation of a variety of intracranial and spinal diseases.
DIAGNOSTIC IMAGING ENHANCES MANAGEMENT OF ACUTE RESPIRATORY DISTRESS SYNDROME.

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Introduction/Purpose: Hypoxemia secondary to acute respiratory distress syndrome (ARDS) often necessitates mechanical ventilation that can cause further parenchymal damage during alveolar recruitment. High resolution computed tomography (HRCT) was used as the gold standard in a porcine model of ARDS to evaluate a novel technique for assessing ventilator induced lung injury. HRCT techniques used during this study were then applied to two mechanically ventilated canine patients with ARDS.

Methods: ARDS was created in five mechanically ventilated swine using a saline lavage model. Inspiratory and expiratory HRCT and lung function testing using a novel, three gas technique of methane, carbon monoxide, and acetylene were performed at variable positive end expiratory pressure (PEEP) settings. Quantification of alveolar recruitment/derecruitment was calculated as the percentage of total voxels that changed from >-500 HU to <-500 HU between expiration and inspiration. Overdistension was calculated as the percentage of voxels at full inspiration having <-800 HU. The HRCT results were compared to alveolar volume, diffusion capacity, and capillary pulmonary capillary blood flow as calculated by the three gas technique. The technique for HRCT of mechanically ventilated patients was applied to two canine patients with ARDS that underwent HRCT within 12 hours of initiating mechanical ventilation and then again within 24-36 hours.

Results: In the porcine model, increased PEEP settings resulted in a reduced mean percentage of recruitment/derecruitment (4.7% ± SD 5.3) compared to a lower PEEP setting (33.0% ± SD 6.3). Higher PEEP settings resulted in an increased percentage of overdistended alveoli (33.7% ± SD 11.3) compared to lower PEEP settings (19.3% ± SD 4.7). Diffusion and perfusion parameters increased at the highest PEEP compared to the lowest PEEP as evaluated by pulmonary function testing. In the canine patients, there was minimal evidence of recruitment/derecruitment or overdistension; however, HRCT allowed monitoring of poorly aerated and normally aerated alveoli over time.

Discussion/Conclusion: HRCT can be used in an animal model of ARDS to assess efficacy of mechanical ventilation, and these results correlate to a novel pulmonary function testing method. Similar techniques can be applied to clinical veterinary patients with ARDS/ALI to monitor lung response to mechanical ventilation.
DETECTION OF FRACTURES OF THE PALMAR PROCESSES OF THE DISTAL PHALANX IN FOALS.

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Introduction/Purpose: Incidence of fractures of the palmar processes (PP) of the distal phalanx is higher than previously thought. A recent study (2010) showed that by 6 months of age, 100% of 17 examined foals had at least one fracture while 78% had bilateral fractures. One reason for the under-reporting is the difficulty of viewing small fractures on radiographs. The possibility of radiographic detection of all fractures is further limited by the irregular structure of the distal phalanx, small size of the fractures, and various stages of bridging and trabecular bone. Therefore, many PP fractures are not detectable on routine radiographic surveys and will remain undiagnosed; those fractures can lead to further complication such as club foot.

Methods: Using an IDEXX EquiView digital imaging system and a MinXray generator, we radiographed both forehooves of 19 young foals (after cleaning and preparing the hooves) using 5 radiographic projections: horizontal beam lateromedial (LM), dorsopalmar (DP), dorso60°proximal-palmarodistal oblique (Dr60Pr-PaDiO), dorso60°proximo45°lateral-palmarodistomedial oblique (Dr60Pr45L-PaDiMO) and dorso60°proximo45°medial-palmarodistolateral oblique (Dr60Pr45M-PaDiLO).

Results: A total of 12 fractures were detected; 3 foals had fractures on both lateral and medial PPs of one forelimb while 1 foal had fractures on both front hooves. Our data showed that such fractures are barely visible on LM and routine DP views; while most fractures can be viewed with Dr60Pr_PaDiO view when the foal stands on the cassette tunnel. However, we found that 42% of the fractures were not identified on this view and were only visible on Dr60Pr45L_PaDiMO and Dr60Pr45M_PaDiLO views. We also found higher incidence of fractures in Thoroughbreds than Arabians.

Discussion/Conclusion: To view a minimally displaced fracture, the radiograph beam should pass virtually parallel to the fracture line which is not always possible. While detection of PP fractures is more likely with digital radiography, a complete survey, including oblique views, provides the greatest likelihood of detecting small PP fractures. This technique will improve the ability to differentiate between artifacts and true fractures of the palmar processes.
Introduction/Purpose: Osteoarthritis (OA) of the metacarpophalangeal joint (MCPJ) is a common cause of lameness in horses. Osteophyte formation is considered one of the main radiographic features of OA. In the equine MCP joint, MRI and CT were shown to be superior to radiography for detection of osteophytosis while radiography was reported superior in another study. Our hypothesis is that osteophytes not previously evident can be identified on the dorsopalmar view if the clinician is aware of the sites of predilection and specifically evaluates these areas.

Methods: Medical records of 20 horses with digital radiographs (DR) and high-field MRI of the MCP joint were reviewed. Horses with evidence of osteoarthritis on MRI, including medial or lateral distal MC3/proximal P1 osteophytosis were selected. Radiographic studies followed by MRI studies of all horses were evaluated retrospectively by a single radiologist and the presence of medial and lateral osteophytes was recorded and described for both imaging modalities.

Results: All horses that had medial and/or lateral osteophytosis on MRI had visible osteophytes on dorsopalmar projection DR. On DR images the osteophytes appeared similar in shape and size when compared to the MRI studies.

Discussion/Conclusion: On MR images the medial and lateral osteophytes of the third metacarpal bone are frequently located dorsal to the transverse ridge where the bone is narrower than at the palmar condyles. Osteophytes in this location may not extend beyond the peripheral margins of the palmar aspect of the condyles. Therefore, specific evaluation of the periarticular margin distal to the collateral fossae provides a method for identifying osteophytes in the MCP joint. These osteophytes can project parallel to the joint margin and can result in thickening and increased opacity of the periarticular margin on oblique projections without associated change in the profile of the bone. Mild oblique projection may further aid in identification of osteophytosis in these regions and investigation of additional views is indicated. In conclusion, advanced imaging continues to improve our interpretation skills in other modal imaging modalities.

CHARACTERIZATION OF TENDON AND LIGAMENT INJURIES OF THE EQUINE DISTAL FORELIMB USING ELASTOGRAPHY.

Introduction/Purpose: Elastography is an ultrasonographic technique that evaluates the stiffness of tissues by measuring the displacement of ultrasound echoes before and after compression. Tendon and ligament injuries are among the most common causes of equine musculoskeletal injury and frequently result in decreased athletic performance and significant financial loss. Elastographic evaluation of the stiffness of equine tendons and ligaments may allow more accurate characterization of lesion severity and sequential examinations may optimize lesion management, rehabilitation, and return to training. Recently, elastography has been proven to be a feasible and repeatable imaging modality for evaluating normal tendons and ligaments of the equine distal forelimb and the normal elastographic appearance of these structures has been established. The purpose of this study was to characterize elastographic findings of injuries to the superficial digital flexor tendon and branches of the suspensory ligament, and to evaluate the differences in the elastographic appearance of acute versus chronic injuries.

Methods: Seventeen horses with lameness originating from the tendons and ligaments of the distal forelimb were evaluated with elastography and these findings correlated with grey scale ultrasonography and magnetic resonance imaging (MRI) when available. Six horses were reevaluated during rehabilitation at 60 and 90 days post injury to characterize the elastographic appearance of tendon and ligament healing, again in correlation with evidence from clinical and grey scale ultrasonographic healing. Images were evaluated qualitatively and quantitatively. Qualitative assessment assigned scores of 1-4 (1=hard; 4=soft) where tissue stiffness is depicted by a color scale (blue=hard; red=soft). For quantitative analysis a mixed effect, repeated measure ANOVA was performed. Qualitative and quantitative assessments were made relative to normal surrounding tissue, the same structure in the contralateral limb as well as with normal horses.

Results: Areas of acute injury were significantly softer than surrounding normal tissue and when compared with normal horses (p=0.007). As healing progressed, areas of acute injury became progressively stiffer. Regions of irregular fiber pattern in horses with long term injury were not different in stiffness compared with normal tendons and ligaments (p=0.671) and the adjacent normal tissues occasionally exhibited small areas of increased softness. Lesions which exhibited increased T2 signal on MRI (n=3) were subjectively softer than surrounding normal tissue. Chronic lesions diagnosed with grey scale ultrasound which did not exhibit increased T2 signal (n=3) exhibited similar elastographic characteristics as the surrounding normal tissues.

Discussion/Conclusion: Elastography adds additional morphologic information to that obtained by grey scale ultrasound, enhances evaluation of acute versus chronic injury and correlates well with MRI examination.
CORRELATION OF MAGNETIC RESONANCE IMAGING AND COMPUTED TOMOGRAPHIC ARTHROGRAPHY WITH GROSS CARTILAGE THICKNESS IN THE EQUINE METACARPOPHALANGEAL JOINT.

Introduction/Purpose: Cartilage damage is the hallmark of early osteoarthritis and early detection of cartilage injury may allow for early interventional therapy and subsequent mitigation of osteoarthrosis in equine athletes. The objective of this prospective study was to determine the accuracy of magnetic resonance imaging (MR), magnetic resonance arthrography (MRA) and multidetector CT arthrography (MDCTA), for evaluation of articular cartilage thickness in equine metacarpophalangeal joints (MCPJ) using macroscopic anatomic measurements as the gold standard.

Methods: Images of 6 equine cadaveric MCPJ were obtained using a 1.5 T MRI before and after intra-articular administration of contrast media consisting of 0.5 ml gadodiamide (287 mg/ml), 7 ml iohexol (300 mgI/ml) and 7 ml saline (0.9% NaCl) into the MCPJ. MR images included proton density with fat saturation (PD FS), steady state free procession (SSFP), T1W with fat saturation (T1FS) and spoiled gradient recalled echo with fat saturation (SPGRFS). MDCTA images of the MCPJ were obtained following intra-articular contrast injection. Cartilage thickness was measured by one examiner on sagittal MR images and by a second examiner on sagittally reformatted MDCTA images at 9 predetermined locations in the MCPJ. Gross cartilage measurements were made by a third examiner at the same anatomic locations on the disarticulated MCPJ. Each examiner was blinded to the measurements obtained by the other examiners. Measurements were compared using a one-way ANOVA and a student’s t-test. Statistical significance was set at p < 0.05.

Results: In general, imaging measurements underestimated gross measurements. On the transverse ridge and sagittal ridge of metacarpal 3, most imaging measurements were significantly smaller than gross measurements. At the corresponding locations on the proximal phalanx, all imaging measurements were significantly smaller than gross measurements. Fewer significant differences between imaging and gross measurements were detected along the dorsal and palmar condyles of MC3.

Discussion/Conclusion: MRA and MDCTA did not significantly increase the accuracy of cartilage measurements in the MCPJ. Imaging measurements made at the level of the sagittal ridge, sagittal groove and transverse ridge are underestimated, likely due to volume averaging and poor articular surface separation. Cartilage measurements can be included in a whole organ assessment of all articular, periarticular and juxta-articular structures in the MCP joint to allow for earlier detection of osteoarthritis, more appropriate intervention and better prognosis in Thoroughbred horses.
ULTRASONOGRAPHIC APPEARANCE OF NORMAL AND INJURED LATERAL PATELLAR LIGAMENTS IN THE EQUINE STIFLE.

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\textbf{Introduction/Purpose:} Ultrasound is widely used in horses with lameness localized to the stifle region, but there is limited information regarding the lateral patellar ligament compared with the middle and medial patellar ligaments. This report describes the normal appearance of the lateral patellar ligament (LPL) in non-lame horses and the clinical and imaging features from a group of horses with LPL injury.

\textbf{Methods:} Twelve horses without stifle lameness underwent ultrasonographic examination of both LPLs. Size, shape, echogenicity and fiber pattern were recorded at 6 levels from origin to insertion. Horses with LPL injury were identified from the records of the UC Davis Large Animal Ultrasound Service. Signalment, history, clinical features, imaging data and outcome were recorded for all cases.

\textbf{Results:} The appearance of the normal LPL changes greatly from origin (patella) to insertion (tibial tuberosity). The LPL is poorly-defined at its origin but is well defined in the proximal ligament region where it flattens to conform to the contour of the lateral trochlear ridge. At the joint level, the LPL assumes an oval to triangular shape with deep margins that are often irregular, including several LPLs that showed large, variably shaped invaginations. These appeared as anechoic to hypoechoic areas with gaps in linear fiber pattern on longitudinal views. The LPL tapers at its tibial insertion with striations apparent in most horses. Review of 569 stifle exams from 1999-2011 revealed 18 horses with LPL injury involving the left (8) and right (10) stifles. Multiple breeds and uses were represented. All injuries were acute, with 7 presumed due to kick trauma. Clinical findings included regional wounds (12), swelling (10) and fibrous lumps (2). Severe lameness (grade 4-5/5) was present in 11 horses (range 0-5/5). Radiography identified fractures of the tibial tuberosity (6), patella (4) and lateral trochlear ridge (1). Ultrasonographic lesions were graded as severe in 78% of cases and most often involved the mid-insertional portion of the LPL. Ultrasound confirmed that fractures directly involved the LPL in 9 horses. Three horses were euthanized due to severe concurrent injuries. Recheck ultrasound in 4 horses showed stable to minimal ultrasonographic improvement. Eight horses returned to their previous use, 2 were retired, 2 were lost to follow-up and 3 remain in rehabilitation.

\textbf{Discussion/Conclusion:} The appearance of the normal LPL differs significantly from that reported of the middle and medial PL. Normal variations in shape, echogenicity and fiber pattern of the LPL are important considerations during ultrasound exams to prevent false positive diagnoses. Although uncommon, LPL injury should be considered in horses with craniolateral stifle trauma. Severe LPL injury was often associated with direct trauma and most commonly involved the mid to insertional region. Prognosis varied from fair to good in horses with primary LPL injury.
American College of Veterinary Radiology

ACVR 2012 Conference Special Activities

Thursday, October 18

Welcome Reception ACVR/VCS
Villaggio Del Sole Terrace 1
Reception supported by
Universal Medical Systems, Inc.
6:30 – 8:30 pm

Special dedication to the memory of Dr. Myron “Mike” Bernstein

Friday, October 19

Poster Presentations and ACVR/VCS Reception
Villaggio Del Sole Terrace 3
6:30 – 8:30 pm
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