PROGRAM COMMITTEE

Mauricio Solano, Program Chair
Ana Caceres, Program Co-Chair (Resident Awards and Activities)
Travis Saveraid, Program Co-Chair (ACVR Forum)
Trisha Oura, Program Co-Chair (Image Interpretation Session)
Nathalie Rademacher, President Ultrasound Society
Gregory Daniel, President Society of Veterinary Nuclear Medicine
Silke Hecht, President CT/MRI Society
Jessica Winger, ACVR Meeting Manager
Susie Wilson, ACVR Administrator

ACVR ADMINISTRATION

Elizabeth Watson, President
Silke Hecht, President-elect
Ron Burk, Treasurer
Tom Nyland, Webmaster/Secretary
Monique Mayer, President, Radiation Oncology
Wm. Tod Drost, Executive Director
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   Small Animal Sports Medicine CE
   Equine Sports Medicine CE
   Lunch and Learn, Sponsored by Antech Imaging Services
   LADIS Keynote Speaker, Dr. Mary Beth Whitcomb, DVM
   Scientific Session 1
   VRU Presentation
   Scientific Session 2 - Resident Presentations
   Welcome Reception, Sponsored by:
      Antech Imaging Services and
      Universal Medical Systems, Inc.

VI. Friday, October 9, 2015 .................................................................................... 37
    VUS Meeting
    Scientific Session 3 - 4 Resident Presentations
    Scientific Session 5
    Nuclear Medicine Society Keynote Speaker
    Lunch and Learn, Sponsored by Universal Imaging, Inc. and Toshiba
    ACVR Image Interpretation Session
    Resident Authored Paper Award
    Podium Presentation/Poster Awards
    ACVR Distinguished Service Award
    Introduction of New Diplomates
    ACVR General Business Meeting (Diplomates Only)
    SVNM Meeting
    Reception, Sponsored by Antech Imaging Services
VII. Saturday, October 10, 2015

CT/MRI Society Meeting
CT/MRI Keynote Speaker, Dr. Tadashi Allen, MD, ABR
Scientific Session 6 – 7
Scientific Poster Presentations
Interventional Radiology CE
Cone Beam CT Forum

VIII. Poster Presentations

IX. Special Activities

X. Conference Registrants

Identification of Registrants
THE AMERICAN COLLEGE OF VETERINARY RADIOLOGY GRATEFULLY ACKNOWLEDGES THE SUPPORT OF THE FOLLOWING COMPANIES AND WISHES TO THANK THEM FOR THEIR CONTRIBUTIONS

ANIMAGE LLC
Dr. Horst Bruning, President
3825 Hopyard Road, Suite 220
Pleasanton CA 94588
Phone: 925-416-1900 ext.111
Email: hbruning@exxim-cc.com
Website: www.animagellc.com

Animage LLC presents Fidex, a veterinary diagnostic imaging system with CT, DR, and fluoroscopy in one machine. Fidex can be CT-only, CT+DR, CT+fluoroscopy, or a three-modality system. Fidex plugs into 110 V or 220 V outlets; has dramatically lower costs of installation, operation, & maintenance; and has better spatial resolution than refurbished human CT scanners. Fidex requires no more shielding than a standard X-ray machine and no special cooling.
For 15 years, AIS has been providing telemedicine and cloud storage to more veterinarians and clinics than any other service. Dr. John Mattoon, the Chief Radiologist for AIS, supervises the professional staff with over 42 full-time staff radiologists, interests, dentists, and other professionals. Dr. Bill Hornof is responsible for Quality Assurance, and the resident program, AIS has sponsored radiology residents at 9 Universities. We are proud to play a leading role in the advancement of telemedicine and the radiology profession.

Asteris is a leading provider of PACS, RIS, and HIS technology solutions for the veterinary community. Designed by veterinarians for veterinarians, our Keystone@ software suite offers a unique, patented approach to digital image management, viewing, sharing, and reporting. Our products and services allow you to focus on premier patient care rather than the technology it requires. Founded in 2004, Asteris is an independently-owned company with offices in New York and Colorado.

BlackwellKing is a Premier Veterinary Recruiting and Consulting Firm specializing in matching qualified candidates with outstanding job opportunities. BlackwellKing is proud to have some of the TOP veterinary hospitals in the world as clients and to be able to introduce highly qualified candidates across the country and around the world. We are able to bridge the gap between hospitals looking for doctors and veterinarians looking for a change. Our skilled team is able to offer guidance and advice to both hospital managers and doctors interested in making a change.
In 2004, VI became a dealer to sell and service Canon brand Digital Radiography (DR) flat panel detectors together with VI’s RadPRO® X-ray modalities in the healthcare, military/government, veterinary, and industrial/security sectors. In April 2009, Canon U.S.A., Inc. acquired VI and VI became a wholly owned subsidiary of Canon U.S.A. Virtual Imaging currently sells and services RadPRO products and Canon DR detectors in the healthcare sector directly in Florida, the Mid-Atlantic, Illinois and California and resells these modules through a dealer channel in other areas of the U.S. In addition to healthcare organizations, Virtual Imaging also provides solutions to the U.S. veterinary sector and to the security industry.

Cuattro's flat panel digital radiography systems improve efficiency and workflow, for increased productivity and lower costs. Cuattro digital flat panel same-day retrofits, complete rooms and mobile digital X-ray systems, and cloud-based archiving and PACS, deliver better performance, perfect images, in half the time of CR or film.

Epica Medical Innovations designs, engineers and builds the most innovative and game changing veterinary CT scanner and Therapeutic devices available for veterinary use. Leveraging science and technology with expert engineering and an understanding of veterinary practice, to deliver products ways that improve the outcomes and safety experienced by patients while reducing costs and improving access to care. Better, safer, smarter, and faster with less pain, and less cost: that is “The Epica Way”.
FUJIFILM MEDICAL SYSTEMS USA, INC.
419 West Avenue
Stamford, CT 06902
Website: www.fujiprivatepractice.com

FUJIFILM Medical Systems, the inventor and world leader in digital x-ray, will showcase the FDR D-EVO, a new digital flat panel detector enabling veterinary practices to transition to DR with no modification to an existing radiographic room. The digital flat panel detector was designed to deliver Fujifilm's renowned image quality and intuitive functionality designed to address the needs of your practice. Systems for viewing, archiving and storing digital x-rays are also available. For more information: www.fujiprivatepractice.com.

GULF COAST VETERINARY SPECIALISTS
1111 W. Loop South, Suite 120
Houston, TX 77027
Phone: 713-693-1111
Website: www.gcvs.com

Gulf Coast Veterinary Specialists was founded in 1988 as one of the first private practice referral-only veterinary hospitals in the country. Our three founding members envisioned a group of highly specialized, board-certified veterinarians who were able to use their combined experience and expertise to provide the highest quality, most comprehensive specialized care for companion animals, as well as working to advance veterinary technology through education and innovation. Today, GCVS is an internationally respected veterinary specialty hospital with 14 departments, 27 specialists, and over 200 trained support staff. GCVS is committed to continuing our legacy of excellence and leading innovation in veterinary medicine as our hospital continues to grow, with new departments added every year since 2011.
HALLMARQ VETERINARY IMAGING LTD.
Unit 5, Bridge Park, Merrow Lane
Guildford, Surrey GU4 7BF, United Kingdom
Phone: +44 (0) 1483 877 812
Fax: +44 (0) 1483 838 954
Email: sales.us@hallmarq.net
Website: www.hallmarq.net

Hallmarq Veterinary Imaging is a specialist veterinary MRI company operating globally and specifically in veterinary MRI. We are world renowned for our initial product; standing equine MRI, and have revolutionized equine practice. Our small animal system; PetVet has done the same thing for companion animal practice. PetVet uses a 1.5T magnet within a self-shielded system, eliminating the need for an expensive RF shielded room. The addition of a zero boil-off cold head means routine helium refills are not necessary. Our financial model is also unique; we work on a pay-as-you-go system meaning large capital investment is not required to get started with MRI in your practice.

IDEXX LABORATORIES
One Idexx Dr.
Westbrook, ME 04038
Phone: (207) 556-0300
Toll Free: (800) 548-6733
Fax: (207) 556-4346
Website: www.idexx.com

So you can focus on productivity and quality of care at every touch point of your day, we focus on innovative products and services that create efficiencies and ensure dependability and accuracy. We’re here to help you deliver real-time care during your patients’ visits, increase client satisfaction and compliance and grow a healthier, more profitable practice. From SNAP® pet-side diagnostic tests, IDEXX VetLab® diagnostic instruments and advanced reference laboratory and consulting services to digital radiography systems, information integration solutions, dependable service and support and education—we have the tools you need to reach your practice’s potential.
Infiniti Medical serves veterinarians and pets with innovative solutions to common diseases. Through partnerships with veterinarians, physicians and engineers, we design and produce state of the art devices that are used by veterinarians throughout the world. In addition to providing an innovative portfolio and pipeline of products, we further support the veterinary field by offering veterinarians unrivaled training opportunities and the necessary support to perform stenting and other advanced procedures.

Oxford Instruments Healthcare specializes in providing quality CT & MRI equipment sales, maintenance service, mobile imaging solutions, quality parts, and biomedical support options to healthcare practitioners across the North America Market. With a dedicated team of highly skilled professionals, a unique Customer Portal, and nationwide service, Oxford Instruments Healthcare continues to deliver world-class service and support. Oxford Instruments Healthcare is ISO 9001:2008 & 13485:2003 certified and has achieved an unmatched reputation quality and integrity while providing much needed cost savings and value to its customers.
scil animal care company is an international organization with 8 subsidiaries throughout Europe, Asia and North America as well as distribution presence in 24 countries globally. We are dedicated to delivering the highest quality of medical equipment to animal health professionals. scil provides the veterinary market with a diverse portfolio of in-house laboratory devices, including laboratory software, diagnostic ultrasound, digital radiography equipment, surgical power tools and implants. scil has also formed exclusive partnerships with industry leaders to guarantee what we are aiming for: Veterinary Excellence!

From behind-the-scenes experimental work for the U.S. Department of Defense to today’s highly advanced small animal ultrasound systems used around the globe, SonoSite has been defining and redefining next-generation point-of-care ultrasound. Emergency Medicine, Anesthesia, Muskuloskeletal and General Practitioner transducers with specialized software that can meet all of your practice needs. 5 Year Warranty.
Sound produces the most widely accepted and used digital radiography, ultrasound, and PACS systems in the veterinary industry. Sound holds leadership positions in ultrasound, digital radiography, PACS, and education. Sound’s Academy of Veterinary Imaging has conducted over 9,000 ultrasound trainings.

Timeless Veterinary Systems is a specialized tech company based in Prince Edward Island, Canada, made up of a small team of big thinkers. We believe in challenging the status quo to develop technologies that raise the bar for veterinary patient care, including point of care apps and customized mobile/telemedicine management systems. Each and every product we develop is carefully designed with some of the most recognized experts in veterinary medicine to ensure the highest quality possible.

Universal Imaging has been setting the standard for veterinary imaging for over 37 years. We offer the largest variety of ultrasound and digital radiography packages featuring all-digital technology, portability, connectivity, education and training. Visit our booth or website today.
Universal Medical Systems, Inc. (Ohio) is the only LICENSED AUTHORIZED DISTRIBUTOR serving the veterinary market selling and leasing NEW CT and MRI scanners exclusively from five of the major manufacturers designed specifically to meet your needs. New or certified systems are available with a variety of financing and service options. Visit us today.

Vet Ray Technology by Sedecal is the world's largest manufacturer of Veterinary specific x-ray equipment. Vet Ray Technology has the top selling small animal table for both digital and film applications and supplies a wide variety of large animal products.

Vet Rocket, located in Santa Clara California, is a manufacturer of digital radiography equipment and software. Founded by the original founder of Eklin Medical System, Vet Rocket develops state-of-the-art DR systems and provides teleradiology software and DICOM storage for veterinary radiologists. Please contact info@vetrocket.com for additional information.
The Veterinary Information Network (VIN) is the premier online community, continuing education, and information resource for veterinarians. Founded in 1991, VIN reaches over 45,000 veterinarians, veterinary students, and industry partners worldwide. VIN is the leader in unlimited access to medical, product and practice management information. For a FREE one month trial membership, join us at www.VIN.com, phone 800-700-4636, or email VINGRAM@vin.com. Let us show you why VIN is the BEST online resource for veterinarians. VIN will provide a free cyber café at the ACVR Annual Conference, so please stop by to check your Email, surf the web, and try VIN!

Voice Recognition Logic is the leading reseller of Dragon Medical Practice Edition 2 in the Veterinary space. We offer a custom veterinarian vocabulary that was developed and is used by board certified veterinarians. Stop by our booth to learn more or visit us at: http://dragonveterinary.com/
American College of Veterinary Radiology
Special Thanks to the following Corporate Partners:

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Sound

**Specialty Coffee Cart Sponsor**
IDEXX Laboratories

**Cyber Café**
Veterinary Information Network (VIN)

**Lunch and Learn**
Antech Imaging Services
Universal Imaging, Inc. and Toshiba

**Audiovisual Sponsor**
Antech Imaging Services

**ACVR Welcome Reception Sponsor**
Antech Imaging Services
Universal Medical Systems, Inc.
Program Overview

2015 ACVR Scientific Conference
October 7-10, 2015
Marriott City Center
Minneapolis, Minnesota

Wednesday, October 7, 2015

7:00 am  
*Registration Opens*  
4th Floor Registration

7:50 am  
Welcome Remarks  
All Day- Ballroom 1-2

**Forum Topic 1: Business Health**

8:00 am  
**101: Starting a Small Business When You’re a Veterinarian With No Business Experience**
Justine Lee, DACVECC, DABT; CEO
VETgirl, LLC

8:50 am  
**Restrictive Covenants, Independent Contractor Agreements, and Other Troubling Employment Issues**
Anne Greenwood Brown, Esq.
Sjoberg & Tebelius, P.A.

9:40 am  
Break

10:10 am  
**Maximize Quality and Productivity with Speech Recognition**
Judith Barnes
Mighty Oak Technology Inc.

11:00 am  
**Tips and Tricks in Developing, Running, and Growing Mobile and Referral Ultrasound Business.** Audience participation encouraged.
Travis Saveraid DVM, DACVR
VetRadiologist, LLC/IDEXX Telemedicine
Christopher Kunze, DVM, DACVR
Veterinary Diagnostic Imaging of Texas
Lee Yanik DVM DACVR Animal Imaging Consultants (Seattle)

11:50 - 1:20 pm  
*Lunch on Your Own*
Forum Topic 2: Radiologist Health

1:20 pm  The Dangerous Life of a Radiologist: Sedentary Behaviors and Cardiometabolic Risk Factors
Manda Keller-Ross, PhD, DPT
Program in Physical Therapy, University of Minnesota

2:10 pm  Ergonomics and the Veterinary Radiologist
Jonathan Reynolds, PT, PhD, CWCE
Physical Therapy-Orthology

3:00 pm  Break

Forum Topic 3: Mental Health
Learn something new: Avian Imaging

3:30 pm  Imaging Workup of Avian Coelomic Distention/Ascites.
(Appropriate diagnostic progression, common causes and imaging findings)
Marie Rush, DVM, Diplomate ACZM

4:20 - 5:10 pm  Diagnostic Imaging of Avian Respiratory Disease.
Marie Rush, DVM, Diplomate ACZM

5:45 - 6:45 pm  Meet with Residency Directors
Dr. Ana Caceres, Moderator

6:45 pm  Adjourn for the Day
### Thursday, October 8, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>7:00 am</td>
<td>Registration Opens</td>
<td>4th Floor Registration</td>
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<tr>
<td>7:00 - 7:50 am</td>
<td>LADIS Society Meeting</td>
<td>Ballroom 1-2</td>
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<tr>
<td>7:50 - 8:00 am</td>
<td>Welcome Remarks and Announcements</td>
<td>Ballroom 1-2</td>
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<tr>
<td>8:00 - 8:15 am</td>
<td>ACVR President’s Address</td>
<td>Ballroom 1-2</td>
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<td>8:15 - 9:15 am</td>
<td>ACVR Keynote Speaker</td>
<td>Ballroom 1-2</td>
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<tr>
<td>9:15 - 10:15 am</td>
<td>Small Animal Sports Medicine CE (Includes Ultrasound Keynote Speaker)</td>
<td>Ballroom 1-2</td>
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<tr>
<td>10:15 - 10:45 am</td>
<td>Break with Exhibitors</td>
<td>Ballroom 3-4</td>
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<tr>
<td>10:45 - 11:45 am</td>
<td>Equine Sports Medicine CE</td>
<td>Ballroom 1-2</td>
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<tr>
<td>11:45 - 1:15 pm</td>
<td><em>Lunch and Learn</em> “Non-academic Residencies; Saving Our Specialty?”</td>
<td>Ballroom 1-2</td>
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<tr>
<td>11:45 - 1:15 pm</td>
<td>OR <em>Lunch on Your Own</em></td>
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<tr>
<td>1:15 - 2:15 pm</td>
<td>LADIS Keynote Speaker</td>
<td>Ballroom 1-2</td>
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<tr>
<td>2:30 - 3:30 pm</td>
<td>Scientific Session 1</td>
<td>Ballroom 1-2</td>
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<tr>
<td>3:30 - 4:00 pm</td>
<td>Break with Exhibitors</td>
<td>Ballroom 3-4</td>
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<tr>
<td>4:00 - 5:00 pm</td>
<td>Veterinary Radiology &amp; Ultrasound (VRU) Journal Peer Review of Manuscripts Submitted to VRU: Why and How?</td>
<td>Ballroom 1-2</td>
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<td>5:00 - 6:00 pm</td>
<td><strong>Scientific Session 2</strong> <em>(Resident Presentations)</em></td>
<td>Ballroom 1-2</td>
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<tr>
<td>6:30 - 8:30 pm</td>
<td>ACVR Welcome Reception</td>
<td>Windows and Terrace 6th Floor</td>
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<td>Sponsored by: Antech Imaging Services</td>
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<td><strong>Adjourn for the Day</strong></td>
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<td><strong>ACVR Welcome Reception</strong></td>
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## Friday, October 9, 2015

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<tr>
<td>7:00 - 7:50 am</td>
<td>Veterinary Ultrasound Society Meeting</td>
<td>Ballroom 1-2</td>
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<td>Announcements</td>
<td>Ballroom 1-2</td>
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<td>8:00 - 9:00 am</td>
<td><strong>Scientific Session 3</strong> (Resident Presentations)</td>
<td>Ballroom 1-2</td>
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<tr>
<td>9:00 - 10:00 am</td>
<td><strong>Scientific Session 4</strong> (Resident Presentations)</td>
<td>Ballroom 1-2</td>
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<td>10:00 - 10:30 am</td>
<td><em>Break with Exhibitors</em></td>
<td>Ballroom 3-4</td>
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<tr>
<td>10:30 - 11:30 am</td>
<td><strong>Scientific Session 5</strong></td>
<td>Ballroom 1-2</td>
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<tr>
<td>11:30 - 12:30 am</td>
<td>Nuclear Medicine Keynote Speaker</td>
<td>Ballroom 1-2</td>
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| 12:30 - 2:00 pm | **Lunch and Learn**  
“Expanding the Clinical Utility of Ultrasound with Advanced Technologies”  
Sponsored by Universal Imaging, Inc. and Toshiba  
Everyone Welcome | Ballroom 1-2       |
| 12:30 - 2:00 pm | OR *Lunch on Your Own*                                                                                   |                    |
| 2:00 - 3:10 pm | ACVR Image Interpretation Session                                                                          | Ballroom 1-2       |
| 3:10 - 3:30 pm | **Resident Authored Paper Award**  
Podium Presentation and Poster Awards, and ACVR Distinguished Service Award  
Drs. Jeryl Jones, Ana Caceres, and Liz Watson | Ballroom 1-2       |
| 3:30 - 4:00 pm | *Break with Exhibitors*                                                                                   | Ballroom 3-4       |
| 4:00 - 4:30 pm | Introduction of New Diplomates  
(Everyone Welcome)                                                                                       | Ballroom 1-2       |
| 4:30 - 5:45 pm | **ACVR General Business Meeting**  
(Diplomates Only)                                                                                         | Ballroom 1-2       |
| 5:50 pm     | Society of Nuclear Medicine Meeting                                                                       | Ballroom 1-2       |
|             | *Adjourn for the Day*                                                                                     |                    |
| 6:30 pm     | **Reception**  
Sponsored by Antech Imaging Services                                                                     | Off-site TBD       |
Saturday, October 10, 2015

7:00 am  Registration Opens  4th Floor Registration

7:00 - 7:50 am  CT/MRI Society Meeting  Ballroom 1-2

7:50 - 8:00 am  Announcements  Ballroom 1-2

8:00 - 9:00 am  CT/MRI Keynote Speaker  Ballroom 1-2

9:00 - 10:00 am  Scientific Session 6  Ballroom 1-2

10:00 - 10:30 am  Break with Exhibitors  Ballroom 3-4

10:30 - 11:30 am  Scientific Session 7  Ballroom 1-2

11:30 - 12:30 pm  Scientific Posters (Authors by Posters)  Atrium

12:30 - 1:30 pm  Lunch on Your Own

1:30 - 3:00 pm  Interventional Radiology CE  Ballroom 1-2

3:00 - 4:30 pm  Cone Beam CT Forum  Ballroom 1-2

4:30 - 4:35 pm  Meeting Concludes  
Dr. Mauricio Solano, Program Chair
Wednesday, October 7, 2015

7:00 am  Registration Opens  
4th Floor Registration

7:50 am  Welcome Remarks  
All Day- Ballroom 1-2

**Forum Topic 1: Business Health**

8:00 am  **101: Starting a Small Business When You're a Veterinarian With No Business Experience**  
Justine Lee, DACVECC, DABT; CEO 
VETgirl, LLC

8:50 am  **Restrictive Covenants, Independent Contractor Agreements, and Other Troubling Employment Issues**  
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Lee Yanik DVM DACVR 
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Manda Keller-Ross, PhD, DPT 
Program in Physical Therapy, University of Minnesota

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5:45 - 6:45 pm  Meet with Residency Directors
Ballroom 1-2
Dr. Ana Caceres, Moderator

6:45 pm  Adjourn for the Day
**Thursday, October 8, 2015**

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<td>Dr. Elizabeth Watson</td>
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<td></td>
<td>Harprit Bedi, MD, Assistant Professor, Tufts University Medical School, Boston, MA</td>
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<td><strong>Small Animal Sports Medicine CE</strong></td>
<td>Ballroom 1-2</td>
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<td>(Includes Ultrasound Keynote Speaker)</td>
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<td></td>
<td>Drs. Cristi R. Cook, DACVR and James L. Cook, ACVS</td>
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<td><em>Break with Exhibitors</em></td>
<td>Ballroom 3-4</td>
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<td>10:45 - 11:45 am</td>
<td><strong>Equine Sports Medicine CE</strong></td>
<td>Ballroom 1-2</td>
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<td>Drs. Meghan Lustgarten, DACVR and Rich Redding, DACVS</td>
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<td>11:45 - 1:15 pm</td>
<td><strong>Lunch and Learn</strong></td>
<td>Ballroom 1-2</td>
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<td>“Non-academic Residencies; Saving Our Specialty?”</td>
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<td>11:45 - 1:15 pm</td>
<td>OR <strong>Lunch on Your Own</strong></td>
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<td>1:15 - 2:15 pm</td>
<td><strong>LADIS Keynote Speaker</strong></td>
<td>Ballroom 1-2</td>
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<td><strong>Non-Musculoskeletal Equine Ultrasound</strong></td>
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<td>(Focus on Abdomen and Thorax)</td>
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<td>Mary Beth Whitcomb, DVM</td>
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<td><em>Scientific Session 1</em></td>
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2:54 - 3:06 pm  **COMPUTED TOMOGRAPHY OF TYMPANIC BULLAE IN PRE-WEANED DAIRY CALVES DIAGNOSED WITH PNEUMONIA.** G. Clausen, S. Nemanic, J. Vanegas, S.M. Stieger-Vanegas and K. P. Poulsen. Oregon State University, Oregon, 97330.


3:18 - 3:30 pm  **ULTRASONOGRAPHIC DIAGNOSIS OF FEMORAL FRACTURES IN LARGE ANIMALS.** S. Jones, M.B. Whitcomb, B. Vaughan, G. Shields. William R. Pritchard Veterinary Medical Teaching Hospital, Department of Surgical & Radiological Sciences, University of California, Davis, CA 95616.

3:30 - 4:00 pm  **Break with Exhibitors**  Ballroom 3-4

4:00 - 5:00 pm  **Peer Review of Manuscripts Submitted to VRU: Why and How?**  Ballroom 1-2
Drs. Jeryl Jones, Editor-in-Chief
Christopher Lamb, Associate Editor
Veterinary Radiology & Ultrasound Journal

**Scientific Session 2**  Ballroom 1-2
(Resident Presentations)

5:00 - 5:12 pm  **USE OF A 15-CHANNEL KNEE COIL VERSUS A 6-CHANNEL BODY MATRIX COIL FOR MAGNETIC RESONANCE IMAGING OF THE DISTAL EQUINE LIMB AT 1.5T.** L.S. Shaikh, S.P. Holmes. University of Georgia, GA 30602.
CONTRAST-ENHANCED ULTRASONOGRAPHIC EVALUATION OF SMALL INTESTINAL VIABILITY IN DOGS WITH OBSTRUCTIVE FOREIGN MATERIAL. C.J. Brouwer, D.A. Jiménez, A. Sharma, E.W. Howerth, M.A. Radlinsky. University of Georgia, GA 30602.


Adjourn for the Day

ACVR Welcome Reception
Sponsored by:
Antech Imaging Services
Universal Medical Systems

Windows and Terrace
6th Floor
MAGNETIC RESONANCE AND RADIOGRAPHIC ASSESSMENT OF THE DISTAL ENTHESIS OF THE DEEP DIGITAL FLEXOR TENDON IN THE HORSE.
V. Janvier, J. Olive, Y. Rossier. University of Montreal - Faculty of Veterinary Medicine - J2S2M2, Saint-Hyacinthe, Quebec, Canada.

Introduction/Purpose: Thickness of the compact bone at the enthesis of the deep digital flexor tendon (DDFT) is sometimes evaluated in suspected cases of podotrochlear syndrome, but without scientific evidence. Objectives of this study were (1) to establish whether radiography correctly estimates the enthesis thickness, (2) to determine the correlation between presence of a DDFT lesion and the thickness of its enthesis, (3) to identify if thickening of the enthesis is predictive of a podotrochlear syndrome in general, (4) to assess abnormalities at the phalangeal enthesis of the distal sesamoidean impar ligament (DSIL) and its relationship with the DDFT enthesis, and finally (5) to compare the presence of abnormalities of the foot synovial compartments with the aspect of the flexor surface of the distal phalanx.

Methods: This retrospective study included horses referred to the Faculty of Veterinary Medicine, University of Montreal, between April 2008 and February 2015 due to forelimb lameness on which a distal extremity magnetic resonance (MR) was performed. MR and radiographic measurements of the compact bone thickness of the distal phalanx at the DDFT enthesis and the length of the distal phalanx were compared. A semi-quantitative grading system was used to score the following abnormalities: 1) osseous resorption, sclerosis and bone oedema at the phalangeal site of insertion of the DSIL, 4) and 5) distension and synovial proliferations of the navicular bursa (NB) and the distal interphalangeal joint (DIJ).

Results: 101 MR studies met the inclusion criteria, 74 of which included podotrochlear lesions and 27 were used as controls. Lateral radiograph of 61 feet were reviewed. There was no significant difference between MR and radiographic ratios evaluating the DDFT enthesis thickness (P=0.80). Thickness of the DDFT enthesis was not increased in case of podotrochlear syndrome (P=0.86) or lesion of the DDFT itself (P=0.50). Age (P=0.89), breed (P=0.68) or duration of lameness (P=0.64) had no apparent influence on the enthesis thickness. Osseous sclerosis at the enthesis of the DSIL had positive correlation with thickening of DDFT enthesis (P=0.006) and with distension of the DIJ (P=0.006). Finally, synovial proliferation of the NB was seen in all cases of grade 2 osseous resorption of the flexor surface of the distal phalanx.

Discussion/Conclusion: Entheses are sites of stress concentration. The collection of closely related tissues serves a common function of stress dissipation. Because enthesis and its related tissues act as an “organ”, concurrent sclerosis at the entheses of both the DSIL and DDFT was anticipated. Although thickening of the compact bone at the DDFT enthesis can be assessed radiographically, it does not seem to be predictive of podotrochlear syndrome and should rather be considered as an inter-individual anatomical variation. Many causes may be responsible for osseous resorption at the enthesis of the DSIL but synovitis of the navicular bursa might play a certain role.
Introduction/Purpose: Positron Emission Tomography (PET) had never been performed in the horse, primarily due to restriction in the availability and accessibility of PET scanners for larger patients. Another concern has been the exposure of operators to high level of radiation. Recent improvement in the PET technology has resulted in the development of high-sensitivity, high-resolution portable PET instruments that can accommodate equine distal extremities. We hypothesized that such scanners would be able to produce PET images of the equine distal limb of diagnostic quality, using reasonable amount of radiation.

Methods: Three horses from a research herd with known naturally occurring distal limb lesions were included in the study. The horses were imaged with a large bore (22.5 cm), portable, preclinical PET instrument with a 22 cm axial field of view and 2 mm spatial resolution. All 3 horses were imaged using $^{18}$F-Fluorodeoxyglucose ($^{18}$F-FDG) and 1 horse was also imaged with $^{18}$F-Sodium Fluoride ($^{18}$F-NaF). Horses were placed under general anesthesia before intravenous injection of the radiopharmaceutical. Imaging started 45 min after injection. Imaging time for each anatomical area was 15 minutes. Both front feet and fetlocks were imaged for $^{18}$F-FDG scans. One carpus and one tarsus were imaged in addition to the front limb distal extremities for the $^{18}$F-NaF scans. Computed tomographic (CT) images of the areas imaged with PET were acquired under general anesthesia on a different day.

Results: A range of 23 to 35 mCi (851 to 1,295 MBq) was used for the $^{18}$F-FDG scans. 22 mCi (814 MBq) was injected for the $^{18}$F-NaF scan. Initial exposure was higher than 50 mRem/hour at the surface of the body at the level of the thorax, but was inferior to 25 mRem/hour 2 hours after injection. A maximum of 10 and 2 mRem/hour were measured 4 hours after injection at the surface of the body and at 1 meter, respectively. Focal increased uptake of $^{18}$F-FDG was appreciated at a site of lysis of the flexor cortex of a navicular bone. Different intensities of $^{18}$F-FDG uptake were appreciated at various lesion sites in deep and superficial digital flexor tendons. Focal areas lacking $^{18}$F-FDG uptake were present in the lamina of a horse with chronic active laminitis. The $^{18}$F-NaF scans revealed focal increased uptake at the distal aspect of navicular bones, at the site of collateral ligament insertion, in some but not all enthesiophytes and in the subchondral bone in a metacarpal condyle and a central tarsal bone.

Discussion/Conclusion: PET images of the equine distal limb of diagnostic quality could be obtained with reasonable amount of radiation exposure. The $^{18}$F-FDG scans provided useful information regarding the activity of soft tissue lesions, and detected areas of laminar necrosis in a case of laminitis. The $^{18}$F-NaF scan allowed differentiation between active and inactive areas of bone resorption or proliferation, and detected subchondral modeling not appreciated on CT images. PET imaging could gain a role in staging lesions or detecting occult subchondral bone lesions in the horse.
**Introduction/Purpose:** Otitis media secondary to chronic pneumonia is a significant problem in dairy calves. CT is more sensitive than radiographs for detecting otitis media. The hypothesis is CT will be superior to radiography for differentiating acute from chronic otitis media in symptomatic calves.

**Methods:** Thirty affected calves were divided into three groups of 10, acute otitis media (Group 1) and chronic otitis media with either single treatment failure (Group 2) or multiple treatment failure (Group 3). Calves had a CT of the head and 4 view skull radiographs dorsoventral, left lateral and left/right 35° dorsal-right/left ventral obliques. At necropsy the bullae were sectioned and photographed. CT and radiographic images were analyzed by three independent observers for fluid in the tympanic bulla, bulla osteolysis and ventral bulla wall thicknesses. Imaging findings were compared to necropsy findings.

**Results:** Rontgen signs of tympanic bulla disease included bullae osteolysis, bullae wall proliferation, and fluid within the bulla similar to previously reported. For osteolysis, CT differentiated Group 1 from Groups 2/3, radiographs differentiated Group 3 from Groups 1 and 2. CT was superior at detecting ventral wall bone proliferation and differentiating acute from chronic otitis media. There was agreement between CT and necropsy findings for bone proliferation and fluid within the bulla, however radiographs resulted in false positives.

**Discussion/Conclusion:** CT was superior for discriminating between acute and chronic otitis media, and 4 view skull radiographs were useful for detecting chronic, end stage otitis media in dairy calves.
ULTRASONOGRAPHY OF THE EQUINE SACRAL NERVES, TECHNIQUE APPEARANCE AND REFERENCE VALUES IN 28 WARMBLOOD HORSES.

**Introduction/Purpose:** The lumbosacral plexus (LSP) represents the nerve supply to the lower back, pelvis and hind limbs. In humans, nerve fibers passing through the LSP can be injured by various mechanisms such as laceration, compression, traction, stretch, radiation and ischemia. In horses LSP plexopathy has never been reported. Peripheral neuropathies are uncommon and can present a diagnostic challenge. Ultrasonography (US) has been used in the differentiation between the various compressive, traumatic, degenerative, neoplastic, and infectious neuropathies in peripheral nerves but there is no published information regarding the US appearance of the LSP and reference dimensions of sacral nerves. The aim of this study was to describe US appearance of the sacral nerves of sound horses and provide reference size values.

**Methods:** 28 healthy Warmblood horses were used for this study. A complete lameness examination was performed in each horse in order to discard animals with apparent lameness. US was performed with a “I” Style Finger-grip 5.0–10MHz microconvex linear-array transducer operating at 10MHz. Horses were sedated with detomidine and placed in stocks. In order to standardize the procedure, trans-rectal ultrasonographic images of the eruption of the sacral nerves (S1, S2 and S3) from the sacral foramina in both sides (left and right) were obtained with the 4 limbs in square position.

**Results:** 15 males and 13 females with ages ranged from 5–15 years (mean = 9.21) were included in the study. The sacral nerves appeared in the longitudinal plane as tubular structure containing hyper echoic linear fiber pattern in a slightly hypoechoic matrix. Real-time blood flow in the caudal gluteal artery was observed in all horses. All nerve roots from S1 to S3 could be identified and measured. S1 was found to be the largest with a mean of 5.1 mm (S.D=1.29). There was no significant difference in vertical diameter between the right and left side. Nevertheless a significant interaction was found among gender, age and eruption of the sacral nerves. In this sense, S1 in young males had the largest vertical diameter and the smallest were found in S3 diameter for females independently of age.

**Discussion/Conclusion:** The normal US anatomy of the ventral branches of the sacral nerves from S1 to S3 forming the LSP described in this paper should help in the detection of anatomical abnormalities when nerve damage is suspected. Perineural compressive lesions or neuritis of sacral nerves may be more easily identified when the normal anatomy and disposition of the nerves has been understood. Nerve conduction studies and needle electromyography can help the clinician to confirm location of nerve injury when abnormal US images are found during the exam.
ULTRASONOGRAPHIC DIAGNOSIS OF FEMORAL FRACTURES IN LARGE ANIMALS. S. Jones\textsuperscript{1}, M.B. Whitcomb\textsuperscript{2}, B. Vaughan\textsuperscript{2}, G. Shields\textsuperscript{1}. \textsuperscript{1}William R. Pritchard Veterinary Medical Teaching Hospital, \textsuperscript{2}Department of Surgical & Radiological Sciences, University of California, Davis, 95616.

Introduction/Purpose: Femoral fractures are an uncommon but significant cause of lameness in large animals and can be challenging to diagnose in the field or hospital setting. Radiography is useful in foals and calves due to their small size but produces limited visibility of the femur in adults and requires transportation to a referral facility. Ultrasound to diagnose pelvic disorders in horses and cattle has become increasingly accepted, yet reports to diagnose femoral fractures are limited. The purpose of this retrospective study is to describe the ultrasonographic features of femoral fractures in large animal patients.

Methods: Medical records of all patients that underwent ultrasonographic examination of the femoropelvic region at the UC Davis Large Animal Ultrasound Service were reviewed from 2000-2014. Animals with ultrasonographic evidence of femoral fracture were included for analysis. Horses with third trochanter fractures were excluded as these have been previously reported.

Results: Eight animals met the inclusion criteria, including 4 horses, 3 cattle and 1 Asian elephant. Four animals presented <48 hours after injury and 4 presented at 5-30 days. All were either toe touching or non-weight bearing lame on the affected limb. One heifer was recumbent on arrival. Crepitus was noted in 2/8 cases and limb swelling in 6/8 animals. Radiography was attempted in 6/8 cases, confirmed fracture of the distal femur in 1 bovine but was non-diagnostic the remaining animals due to inability to visualize the proximal-mid femur in 5/6 patients. Ultrasound of the femur revealed single to multiple step defects consistent with fracture displacement in all cases. Associated muscle tearing or hematoma formation was identified in 5/7 animals. Real-time displacement of fracture ends was visualized upon limb manipulation or weight shifting in 3 animals. Necropsy confirmed femoral fractures in 8/8 cases, including comminuted diaphyseal fractures (4), greater trochanter fracture (2), lateral femoral condylar fracture (1) and capital physeal fracture (1).

Discussion/Conclusion: Femoral fractures carry a grave prognosis and can be a diagnostic challenge in large animals due to the extent of surrounding muscle mass and associated regional swelling. Affected animals were reluctant or unable to move or stand due to severe pain. Ultrasound provided an excellent stall-side diagnostic alternative but required anatomic knowledge of individual species to facilitate diagnosis in some cases. Excellent correlation between ultrasound and necropsy findings supports the use of ultrasound in cases where femoral fracture is suspected but traditional imaging modalities have been inconclusive.

**Introduction/Purpose:** Evaluation of the equine distal limb with high-field magnetic resonance (MR) imaging provides excellent anatomic detail for evaluation of pathologic change. The ever increasing expectations of MRI defining smaller structures, such as cartilage, has driven the development of multichannel, phased array coils. Multichannel coils provide the sensitivity of individual surface coils combined with a large field of view typified by volume coils. While higher-channel coils are more expensive, they are expected to provide excellent resolution with increased signal to noise ratio (SNR) and better image quality relative to fewer-channel coils. The purpose of this study was to compare common imaging sequences used in the distal equine limb acquired with a 15-channel knee coil and a 6-channel body matrix coil.

**Methods:** MR studies of the distal equine limb were reviewed for use of a 6-channel body matrix coil or a 15-channel transmit/receive knee coil using a 1.5T Siemens Symphony with TIM® MRI unit. Sequence performance was evaluated on transverse plane proton-density (PD) images, dorsal plane proton-density images with fat suppression (PD-FS), and transverse plane short tau inversion recovery (STIR) images. TR, TE, field of view, and acquisition matrix were unchanged between horses. Parallel acquisition (iPAT) and BLADE radial k-space ordering was used in all series. The digital cushion in transverse images and the medullary cavity of the middle phalanx in dorsal plane images were used as structures unaffected by disease to determine SNR values. SNR values were calculated for all sequences using repeated measures and were compared between the knee coil and body matrix coil using an unpaired Student’s t-test with unequal variance. Subjective measures of coil performance included ease of use, uniformity of fat suppression, and presence of coil artifact.

**Results:** The following numbers of image series were reviewed: 32 PD transverse with knee coil, 23 PD transverse with body matrix coil, 31 STIR with knee coil, 14 STIR with body matrix coil, 30 PD-FS with knee coil, and 15 PD-FS with body matrix coil. SNR for PD-FS images was significantly higher using the body matrix coil compared to the knee coil (p <0.01). SNR for PD transverse images was higher using the knee coil (p=0.048). For STIR transverse images, no statistical difference in SNR was detected (p=0.80). The body matrix coil was mildly more time-efficient in switching between limbs (mean of 12 minutes versus 14 minutes). Both coils intermittently produced non-uniform fat suppression on PD-FS (body matrix 13/15 series, knee coil 13/30 series). Mild coil enhancement artifact was encountered (body matrix 8/15 series, knee coil 22/30 series), but did not impact image interpretation.

**Discussion/Conclusion:** Both the 15-channel knee coil and the 6-channel body matrix coil produced high-quality images of the equine distal limb at 1.5T, with and without fat suppression techniques. The increased cost of the knee coil may not be justified over the body matrix coil given the ease of use of the body matrix coil and equivalence in image quality.
CONTRAST-ENHANCED ULTRASONOGRAPHIC EVALUATION OF SMALL INTESTINAL VIABILITY IN DOGS WITH OBSTRUCTIVE FOREIGN MATERIAL. C.J. Brouwer, D.A. Jiménez, A. Sharma, E.W. Howerth, M.A. Radlinsky. University of Georgia, GA 30602.

Introduction/Purpose: Ischemia of the small intestine, secondary to foreign body obstruction, is a life threatening condition. Accurate, expedient, and reliable pre-operative diagnosis of small intestinal ischemia would change the triage status, prognosis, surgical expertise, and perioperative resources/costs of small intestinal obstruction cases. In humans, ultrasound contrast media have been used to diagnose intestinal ischemic injury. Microbubble ultrasound contrast medium has been successfully used to evaluate normal canine jejunum. The purpose of this study is to assess the feasibility and accuracy of using contrast-enhanced ultrasonography as a non-invasive, pre-operative method to assess intestinal ischemic injury secondary to foreign body obstruction in dogs.

Methods: Dogs with small intestinal obstructive material were prospectively enrolled in the study. Inclusion criteria included small intestinal obstruction with foreign material confirmed with abdominal radiography and ultrasonography, owner consent for surgery, and intestinal resection-anastomosis (R&A) if indicated. Pre-operative contrast-enhanced ultrasonographic evaluation (Optison 0.03 mL/kg IV; GE Logiq S8 Vet) of the site of obstruction as well as adjacent, unaffected small intestine was performed. Subjective evaluation of enhancement and perfusion was based on a five point scoring system (definitely negative = 1, probably negative = 2, equivocal = 3, probably positive = 4, definitely positive =5). At surgery, a board-certified surgeon evaluated small intestinal viability by routine intra-operative methods, applied a similar five point score for perceived viability, and performed R&A when deemed necessary. If performed, the resected segment was submitted for histopathologic evaluation of ischemia and necrosis, which served as the gold standard.

Results: Eleven dogs have been enrolled in the study, No dogs had complications associated with the use of ultrasonographic contrast medium. Of the 11 dogs, 6 had an R&A procedure performed. All resected intestinal segments submitted for histopathology were confirmed to have areas of intestinal wall necrosis. Five of the 6 confirmed cases of ischemia, both CEUS and surgery were graded as 4 or 5. In one case CEUS was scored as 5 and surgery score was 3. This case underwent R&A, which confirmed ischemia. In another case, CEUS was 3; surgery was definitive and confirmed on histology. Of the remaining 5 cases that did not undergo an R&A, 2 had CEUS grades of 4 or 5 and surgical grades of 2 or 3. There was good agreement (5 out of the 6 patients) between subjective assessment of the contrast-enhanced ultrasonographic and intra-operative assessment for potential intestinal ischemia compared to histopathologic evaluation.

Discussion/Conclusion: Based on these initial results CEUS is highly correlated with surgical findings and histopathology in the pre-operative assessment of small-intestinal ischemia associated with foreign body obstruction.

Introduction/Purpose: Virtual navigation software fuses the images from a cross sectional imaging study such as Computed Tomography (CT) with real time ultrasound (US) by recognizing the spatial orientation of the ultrasound probe and coordinating the US image with the corresponding cross sectional imaging slice. This technique provides an opportunity to compare the appearance of liver lesions between CT and US and may enhance precision of ultrasound guided aspirates and biopsies, particularly for lesions only apparent with CT imaging. The use of virtual navigation has not been described in small animals. The purposes of this study were to determine the feasibility of virtual navigation fusing CT and US in the canine liver, and describe the clinical utility of virtual navigation in a series of dogs with hepatic lesions.

Methods: To test accuracy of image registration, hepatic pseudolesions were created in canine cadavers euthanized for other purposes and the liver was imaged with CT. Using fusion technique, needles were placed under ultrasound guidance as close as possible to the pseudolesion visible in CT images. The liver was rescanned with CT and the distance between the lesion and needle tip was measured. Client owned dogs with known hepatic lesions identified on either CT or ultrasound were enrolled prospectively. Fusion of the axial CT images was performed with real time ultrasound and hepatic lesions were percutaneously sampled. Comparison of the tomographic and ultrasonographic appearance, as well as correlation with cytologic and histologic results was performed.

Results: Virtual navigation software can successfully be used to fuse CT and US of the canine liver. Registration using anatomic landmarks near the area of interest are most accurate. For the canine liver, the xiphoid process is recommended as an internal registration landmark. The average accuracy of targeting pseudolesions in cadavers was 6.7mm (SD 3.3mm) between the needle tip and the center of the pseudolesion. A total of 20 clinical patients were prospectively recruited and a total of 29 sites were sampled. Five lesions (17.2%) were identified with CT but not with ultrasound. Three (10.3%) were seen ultrasonographically but not with CT. There is variability in both the CT and ultrasonographic appearance of hepatic lesions. Target lesions were seen in 3 patients in both CT and US images, and in all patients these lesions were histopathologically diagnosed as malignant neuroendocrine neoplasia.

Discussion/Conclusion: Virtual navigation with fusion of CT and US images of the canine liver is feasible and can be used to assist in sampling lesions. Further studies are needed to determine whether clinical outcomes are affected by use of virtual navigation. Navigation software may be helpful for increasing the accuracy of ultrasound guided sampling in lesions detectable with CT which are difficult or impossible to visualize with ultrasound.
Introduction/Purpose: Permanent hearing loss following general anesthesia is reported in dogs. The mechanism is unknown and the occurrence might be associated with dental and ear cleaning procedures. One possible cause is ischemic injury to the inner ear because of reduced vertibrobasilar perfusion. In dogs, the paired vertebral arteries anastomose with the ventral spinal artery and continue rostrally as the basilar artery, which gives rise to the left and right labyrinthine arteries that are the sole arterial supply to the cochleae. We hypothesize that flexion and/or rotation of the head and neck would compress one or both vertebral arteries between the paracondylar processes and the wings of the atlas and reduce vertebral blood flow into the basilar artery (and hence reduced flow to both inner ears). The study aims are to use non-invasive imaging techniques in healthy dogs to document the anatomic relationships between the paracondylar processes, the wings of the atlas, and the vertebral arteries, and to look for evidence of altered blood flow in those arteries in different head and neck positions.

Methods: The study is performed in two parts: a pilot study and a cross-sectional study. For the pilot study, 3-D time-of-flight magnetic resonance angiography (MRA), ultrasonography, and computed tomography angiography (CTA) were performed in two healthy anesthetized dogs to determine which imaging technique/s and which patient positions were best to evaluate the anatomic relationships and blood flow within the vertebral and basilar arteries. For the cross-sectional study, the selected imaging techniques based on the results of the pilot study will be performed in 6 healthy anesthetized dogs. Comparisons are made between patient positions and sites believed to be upstream and downstream to the site of compression.

Results: The pilot study is completed. CTA and MRA depicted excellent morphology, showing reduced distance between the paracondylar processes and the wings of the atlas during flexion, with possible compression of the vertebral arteries. Pulsed wave Doppler analysis provided the best assessment of blood flow showing a reduction in flow velocity of 41% in the basilar artery and 23% in the vertebral artery during head and neck flexion.

Discussion/Conclusion: The results of the pilot study provided morphologic evidence for our hypothesis and indicated that pulsed wave Doppler analysis of the arteries is the best imaging technique to perform in the proposed cross-sectional study. The results of the pilot and cross-sectional studies will be presented. Vertibrobasilar insufficiency related to head and neck position might be part of the pathogenesis of developing permanent hearing loss in anesthetized dogs.
Introduction/Purpose: Prompt, accurate radiographic diagnosis of small intestinal mechanical obstruction is necessary to minimize patient morbidity and optimize outcome. The accuracy of off-site, portable hand-held devices has been validated in numerous human clinical studies, and the benefits of these modalities for identifying abnormalities and improving clinical diagnoses are established. The Joint Photographic Experts Group (JPEG) created an image compression format that permits rapid transfer of photo quality radiographs without significant image degradation. Currently, data is lacking in companion animals regarding the comparative value of medical image interpretation using compressed versus non-compressed images. Our objective is to compare the diagnostic accuracy of two imaging formats in naturally occurring, small intestinal mechanical obstructions in dogs and cats.

Methods: Two board-certified veterinary radiologists (R1 and R2) interpreted randomly assigned 2-view abdominal radiographs from 100 dog and cats (60 obstructed, 40 non-obstructed) that presented to the emergency service for acute vomiting. Outcome was confirmed by surgery and/or abdominal ultrasonography. Two separate imaging systems were tested: 1) abdominal radiographs in JPEG-format transmitted to an off-site iPhone 6, and 2) DICOM-format radiographs reviewed at an on-site PACS workstation. A modified 5-point Likert scale was used for scoring. Receiver operating characteristic (ROC) curves of each reviewer-imaging system combination were generated to assess accuracy. The area under the ROC curves (AUCs) were compared between imaging systems and used to measure how well each system distinguished between the diagnostic groups (obstructed vs. non-obstructed).

Results: Veterinary radiologists’ accuracy did not differ significantly between the imaging systems. DICOM/PACS system AUC/accuracy by R1 was 93% (CI 86.3%-99.7%), and JPEG/iPhone system accuracy 88.4% (CI 78.5%-98.4%) (P=0.45). DICOM/PACS system accuracy by R2 was 84.3% (CI 72.6%-92.4%), and JPEG/iPhone system accuracy 86.3% (CI 75.3%-97.4%) (P=0.81).

Discussion/Conclusion: Based on the results of this study, radiologists’ accuracy for evaluation of abdominal radiographs in JPEG-format using an off-site iPhone 6 did not differ significantly to that of the traditional DICOM-format PACS workstation for diagnosing small intestinal mechanical obstruction in dogs and cats. These results may permit efficient and productive interactions between primary care veterinarians, residents, and off-site radiologists when evaluating radiographs for small intestinal mechanical obstruction in dogs and cats.
Friday, October 9, 2015

7:00 am  
*Registration Opens*  
4th Floor Registration

7:00 - 7:50 am  
Veterinary Ultrasound Society Meeting  
Ballroom 1-2

7:50 - 8:00 am  
**Announcements**  
Dr. Mauricio Solano, Program Chair

Scientific Session 3  
(Resident Presentations)  
Ballroom 1-2

8:00 - 8:12 am  
**DYNAMIC SUSCEPTIBILITY CONTRAST MAGNETIC RESONANCE IMAGING PROTOCOL OF THE NORMAL CANINE BRAIN AT 1.5T.**  
K. Stadler, A. Pease and E. Ballegeer. Department of Small Animal Clinical Sciences, Michigan State University, East Lansing, MI 48824.

8:12 - 8:24 am  
**IMPACT OF INSPIRATORY VS. EXPIRATORY LUNG CT FOR DETECTION OF PULMONARY NODULES AND BULLAE.**  

8:24 - 8:36 am  
**EVALUATION OF MAGNETIC RESONANCE IMAGING IN THE DIFFERENTIATION OF INFLAMMATORY, NEOPLASTIC, AND VASCULAR INTRADURAL SPINAL CORD DISEASES IN THE DOG.**  
1Texas A&M University, TX, 77843; 2University of Pretoria, Onderstepoort 0110, South Africa; 3University of Tennessee, TN, 37996; 4University of Georgia, GA, 30602; 5Virginia-Maryland Regional College of Veterinary Medicine, VA, 24061; 6Washington State University, WA, 99164.

8:36 - 8:48 am  
**COMPUTATIONAL FLUID DYNAMICS USING COMPUTED TOMOGRAPHY TO ASSESS AIRWAY RESISTANCE IN BRACHYCEPHALIC DOGS.**  
1Department of Veterinary Clinical Sciences and 2Department of Biomedical Engineering, The Ohio State University, Columbus, OH 43210.

8:48 - 9:00 am  
**DIFFUSION WEIGHTED IMAGING OF CANINE INTRACRANIAL DISEASE.**  
9:00 - 9:12 am  

9:12 - 9:24 am  
GADOXETATE DISODIUM (EOVIST®) ENHANCED MAGNETIC RESONANCE IMAGING CHARACTERISTICS OF HEPATOCELLULAR CARCINOMA IN DOGS. C. Constant, S. Hecht, C. Lux, C. M. Cannon, G. A. Conklin, L. E. Craig. Department of Small Animal Clinical Sciences, University of Tennessee College of Veterinary Medicine, Knoxville, TN 37996.

9:24 - 9:36 am  

9:36 - 9:48 am  

9:48 - 10:00 am  

10:00 - 10:30 am  
Break with Exhibitors  

10:30 - 10:42 am  

10:42 - 10:54 am  
10:54 - 11:06 am  CONTRAST-ENHANCED ULTRASONOGRAPHY OF PERIPHERAL PULMONARY AND MEDIASTINAL MASS LESIONS IN DOGS AND CATS. T. Rick, M. Kleiter, I. Schwendenwein, M. Reifinger, K.M. Hittmair. University of Veterinary Medicine, 1210 Vienna, Austria.


11:18 - 11:30 am  EVALUATION OF THYROID UPTAKE OF $^{99m}$Tc-PERTECHNETATE FOR DIAGNOSIS AND STAGING OF DISEASE SEVERITY IN CATS WITH HYPERTHYROIDISM. M.E. Peterson$^{1,2}$, J.N. Guterl$^1$, M. Rishniw$^2$, M.R. Broome$^3$. $^1$Animal Endocrine Clinic, New York, NY 10025; $^2$Cornell University, Ithaca, NY 14853; $^3$Advanced Veterinary Medical Imaging, Tustin, CA.

11:30 - 12:30 pm  NM Keynote Speaker
Feline Thyroid Disease with Focus on Treatment of Severe Unresponsive Recurrent Hyperthyroidism.
Dr. Michael R. Broome, DVM, MS, DACVP

12:30 - 2:00 pm  Lunch and Learn  Ballroom 1-2
“Expanding the Clinical Utility of Ultrasound with Advanced Technologies”
Sponsored by Universal Imaging, Inc. and Toshiba
Everyone Welcome

12:30 - 2:00 pm  OR Lunch on Your Own

2:00 - 3:10 pm  ACVR Image Interpretation Session  Ballroom 1-2
Dr. Trisha Oura (moderator)

3:10 - 3:30 pm  Resident Authored Paper Award  Podium Presentation and Poster Awards, and ACVR Distinguished Service Award  Ballroom 1-2
Drs. Jeryl Jones, Ana Caceres, and Liz Watson

3:30 - 4:00 pm  Break with Exhibitors  Ballroom 3-4

4:00 - 4:30 pm  Introduction of New Diplomates  Ballroom 1-2
(Everyone Welcome)

4:30 - 5:45 pm  ACVR General Business Meeting  Ballroom 1-2
(Diplomates Only)
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<td>5:50 pm</td>
<td>Society of Nuclear Medicine Meeting</td>
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<td><em>Adjourn for the Day</em></td>
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<td>6:30 pm</td>
<td><strong>Reception</strong></td>
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Introduction/Purpose: Dynamic susceptibility contrast magnetic resonance imaging (DSC-MRI) is a non-invasive imaging method to visualize tissue perfusion. These techniques can provide early delineation of blood flow alterations and allow for interpretation of underlying hemodynamic disturbances in intracranial pathology. To date, there is minimal data on DSC-MRI of veterinary patients and no clearly defined clinical protocol. The aim of this study was to determine a standardized 1.5T DSC-MRI protocol for the normal canine patient.

Methods: A prospective study was conducted using healthy dogs greater than 5 years of age. The dogs were placed into two size categories small (<11kg) and large (>11kg). All scans were performed using a 1.5T Siemens Espree and an 8-channel head coil. All dogs underwent an abbreviated conventional pre-contrast MRI scan. DSC-MRI was performed using an adjusted Siemens protocol (ep2d_perf) with 50 measurements. For DSC-MRI, contrast media (gadobenate dimeglumine, (Multihance®) was injected using an automatic power injector (Spectris Solaris ®, Medrad). A dose and rate of 0.2mmol/kg contrast at 3mls/sec followed by 10mls saline flush at 3mls/sec was used in all large dogs. One small dog received the same dose and rate. The remainder of small dogs received a protocol of 0.4mmol/kg contrast at 1.5mls/sec with a 10mls saline flush at 1.5 mls/sec. Injections were made after 5 MR measurements were obtained. Following this, a post-contrast T1 transverse study was performed. Post processing of DSC-MRI images was performed with Siemens MRI analysis software (syngo MR NeuroPerfusion) and perfusion maps were generated.

Results: Fifteen dogs met the inclusion criteria for this study; 11 large dogs and 5 small dogs. The injection protocol of 0.2mmol/kg GAD followed by 10mls saline flush at an injection rate of 3mls/sec generated a useable perfusion map in all large dogs. In a small dog, this protocol did not generate a useable map. A useable perfusion map was generated in the remaining small dogs (n=4) receiving the 0.4mmol/kg GAD and 10mls saline flush at an injection rate of 1.5mls/sec protocol. Total scan time for acquisition of the DSC-MRI images was just under 2 minutes using 50 measurements. Post-processing time for map generation was approximately 10 minutes.

Discussion/Conclusion: DSC-MRI is widely used in human medicine for acute cerebrovascular events and tumor staging and regrowth. This study establishes a protocol for canine 1.5T DSC-MRI imaging that is different in large and small dogs. These protocols may be used for future applications to evaluate hemodynamic disturbances in canine intracranial pathology.
IMPACT OF IN- VS. EXPIRATORY LUNG CT FOR DETECTION OF PULMONARY NODULES AND BULLAE. K.M. Simone, I.D.Robertson, G.S. Seiler. North Carolina State University, NC 27607.

Introduction/Purpose: Veterinary thoracic computed tomography (CT) presents challenges due to respiratory motion that can alter interpretation and potentially decrease diagnostic accuracy for many thoracic diseases including pulmonary nodules and pulmonary bullae. Breath holding can help minimize motion artifact and can be achieved either with positive pressure ventilation or hyperventilation with subsequent expiratory respiratory pause. The purpose of this study was to determine the impact of the two methods on lung imaging and the detection of pulmonary nodules and bullae.

Methods: Dogs and cats that had thoracic CT performed in sternal recumbency were enrolled in this study. Inspiratory (positive pressure ventilation) and expiratory (hyperventilation followed by prolonged expiratory pause) pre-contrast CT images were prospectively acquired. The average Hounsfield Units (HU) of the caudal pulmonary parenchyma was measured in ten normal dogs to assess the percentage of non-aerated and poorly aerated lung in inspiratory and expiratory CT scans. Non-aerated and poorly aerated lung tissue was defined as having an average HU of -100 to +100 and -500 to -100, respectively. Images of normal and abnormal patients were anonymized, randomized, and independently reviewed by radiologists unaware of the diagnosis or breath-hold technique. The number, size, and location of pulmonary nodules and bullae were recorded.

Results: In 10 normal dogs, 0.9% of the pulmonary parenchyma was non-aerated and 4.0% was poorly aerated in inspiratory images. For expiratory images of this same population, 1.2% of the pulmonary parenchyma was non-aerated and 8.6% was poorly aerated. 51 canine and 12 feline thoracic CT studies were included for evaluation of presence of pulmonary lesions, resulting in 63 total patients and 126 image series. The average number of nodules detected in inspiratory CT images was 6.8 (SD 12.9) and 6.6 (SD 12.4) in expiratory CT studies. The average number of nodules detected in inspiratory CT in dogs was 7.2 (SD 14.2) and in expiratory CT was 6.9 (SD 13.6). In cats, the average number of nodules detected in inspiratory CT was 5.5 (SD 11.5) and in expiratory CT 5.7 (SD 11.3). The average number of bullae detected was similar in expiratory (1.04, SD 3.7) and inspiratory images (1.03, SD 3.6). None of the differences were statistically significant when using p<0.05 as level of significance.

Discussion/Conclusion: In this group of patients there was no significant difference in the detection of pulmonary nodules or bullae between inspiratory and expiratory thoracic CT for both dogs and cat. The results suggest that thoracic CT performed during an expiratory pause results in an approximately 5% increase in non- and poorly aerated lung parenchyma but this does not significantly compromise detection of pulmonary nodules and bullae.

Texas A&M University, TX, 77843; University of Pretoria, Onderstepoort 0110, South Africa; University of Tennessee, TN, 37996; University of Georgia, GA, 30602; Virginia-Maryland Regional College of Veterinary Medicine, VA, 24061; Washington State University, WA, 99164.

Introduction/Purpose: Magnetic resonance imaging (MRI) is a commonly used non-invasive means to characterize intradural spinal cord lesions in dogs. The purposes of this study were 1) to estimate sensitivity (Se) and specificity (Sp) of routine, high-field MRI to broadly categorize intradural spinal cord diseases as neoplastic, inflammatory, or vascular in a group of cases with confirmed histopathological diagnoses; and 2) to estimate Se and Sp of MRI to determine tumor type within the broad etiologic category of neoplasia.

Methods: Medical records from five veterinary medical teaching hospitals were retrospectively searched from 2007-2014 for dogs with a ≥1T spinal cord MRI that had a histologically confirmed intradural neoplastic, inflammatory, or vascular disease (affected group). Dogs from these institutions with ≥1T MRI and histological findings compatible with degenerative myelopathy (DM) or SOD-1 mutation homozygosity served as negative controls as intradural signal change has not been recognized in DM. 91 cases were obtained: 19 DM, 53 neoplasms, 10 inflammatory diseases, and 9 vascular myelopathies. T2-weighted (T2W) sagittal and transverse sequences, and T1-weighted (T1W) pre- and post-contrast transverse sequences were independently evaluated by a board certified radiologist who was blinded to histological diagnosis and clinical data.

Results: MRI had a Se (95% confidence interval) =0.99 (0.93, 1.0) and Sp=0.68 (0.46, 0.86) to classify dogs as having intradural lesions. MRI had a Se=0.85 (0.73, 0.93) and Sp=0.58 (0.35, 0.78) to identify neoplastic etiologies; Se=0.50 (0.21, 0.79) and Sp=0.81 (0.69, 0.89) to classify etiologies as inflammatory; and Se=0.00 (0.00, 0.28) and Sp=0.98 (0.92, 1.00) to classify lesions as vascular. The Se and Sp (with 95% confidence intervals) to classify lesions as menigioma, nerve sheath tumor, and nephroblastoma were 0.63 (0.42, 0.80) and 0.97 (0.84, 1.00), 1.00 (0.61, 1.00) and 0.81 (0.68, 0.90), and 0.43 (0.12, 0.78) and 1.00 (0.94, 1.00), respectively.

Discussion/Conclusion: MRI is sensitive for identifying the presence of an intradural lesion, but only moderately specific, and was most sensitive for identifying neoplastic lesions. The Se of MRI for classifying lesions as inflammatory or vascular was low, which might reflect inherent limitations of this imaging modality, MRI sequences used in this study, or case selection.
Computational Fluid Dynamics Using Computed Tomography to Assess Airway Resistance in Brachycephalic Dogs. E.T. Hostnik, B.A. Scansen, R.E. Zielinski, and S.N. Ghadiali. 1Department of Veterinary Clinical Sciences and 2Department of Biomedical Engineering, The Ohio State University, Columbus, OH 43210.

Introduction/Purpose: Obstructive airway disease is common in brachycephalic dogs. Stenotic nares, edematous intranasal turbinates, mucosal swelling, and an elongated, thickened soft palate are sources of airflow resistance. Surgery has traditionally focused on resection of excessive nares and soft palate, without objective measures to validate efficacy.

Methods: Twenty-three non-operated brachycephalic dogs were recruited for this pilot study. A 128 multi-detector computed tomography (MD-CT) scan was performed in all dogs, from rostral nares to diaphragm (SOMATOM Definition Flash; Siemens Healthcare). MD-CT examinations were performed using conscious sedation and without endotracheal intubation.

Raw MD-CT data were imported into ScanIP software (Simpleware, Version 7.0) to render a three-dimensional surface mesh model by automatic segmentation using -1024 to -450 Hounsfield units to isolate the air-filled nasal passage from the nares to the caudal soft palate. Three-dimensional surface models were then imported into COMSOL Multiphysics 5.0 with MATLAB (COMSOL, Inc., Version 5.0.1.276) for computational fluid dynamic modeling and calculation of airway resistance.

Results: The nasal passages were modeled and airway resistance calculated in all dogs. Airway resistance varied widely; mean and SD of 10,034.81 +/- 12,308.45 Pa/L/s. Airway resistance did not correlate with age (r = 0.338, P = 0.115) or weight (r = -0.113, P = 0.609). In 20/23 dogs, the rostral third of the nasal passage showed the greatest step-up of airflow resistance.

Discussion/Conclusion: Computational fluid dynamics derived from nasal MD-CT can quantify airway resistance in dogs. This methodology may have utility for objectively studying surgical interventions in canine brachycephalic airway syndrome.
Introduction/Purpose: Magnetic resonance diffusion imaging has been a focus of human neuroimaging due to its potential utility in helping to further characterize and differentiate intracranial disease, direct therapy, predict prognosis, monitor recurrence and provide an innocuous alternative for the highly invasive gold standard, tissue biopsy. In veterinary medicine, data on the use of diffusion imaging to differentiate intracranial neoplasia is scarce and without any sizable sample to test relevance. The purpose of this retrospective and prospective study is to determine whether diffusion imaging values can be used to distinguish between different types of intracranial disease and guide further treatment.

Methods: Apparent diffusion coefficients (ADC) and fractional anisotropy (FA) values were calculated in dogs with histologically confirmed intracranial disease. Dogs were separated into groups according to etiology, including: meningioma (17), glial cell tumors (15), metastatic neoplasia (5), inflammatory disease (14), hemangiosarcoma (3), infarctions (2), and choroid plexus tumors (2). Few other patients, with only a single case, were also incorporated in the study. However, given the small sample sizes for multiple disease categories, only the meningioma, glial cell tumors, metastatic neoplasia, inflammatory disease and hemangiosarcoma patients were included in statistical analysis. Circular regions of interest were placed in three different locations of each lesion independently by two separate observers. Normal and edematous tissue surrounding the lesions were not included in the regions of interest.

Results: A total of 63 dogs were included in the study. No significant differences were identified between different neoplasms or between neoplastic and inflammatory lesions for ADC or FA measurements. Approximately 35% of neoplastic ADC values measured above 1.362, and no inflammatory lesion was noted to measure above this value.

Discussion/Conclusion: An ADC value of 1.362 could be useful as a possible cut off value for determining the likelihood of intracranial neoplasia vs inflammatory disease. However, while this cutoff may have reasonable specificity as inflammatory lesions never had values higher than this; the sensitivity of this measure may be somewhat limited, as only 35% of neoplastic lesions exhibited an ADC above this. Changes in ADC and FA values identified in human medicine are predominantly used for grading or sub-classifying tumor types to help direct therapy and determine prognosis. ADC values of normal brain parenchyma are used as a comparison to determine benign versus malignant meningiomas, in addition to the fact that malignant meningiomas typically have lower ADC values compared to benign meningeal masses. Use of glial cell tumor values for determination of grading is still under debate, but there appears to be a loose correlation with FA values and glial grading. Due to the lack of subcategorization of different grades or classification of neoplastic lesions, this could not be utilized in our study. Further histopathological classification of intracranial neoplasia in veterinary medicine would allow further subdivision of the neoplastic lesions, and thus potential significant data that will aid in the determination of prognosis for our patients.

Introduction/Purpose: Cranial cruciate ligament (CCL) disease is the most common cause of lameness localized to the stifle joint in dogs. Often, dogs are affected bilaterally and asymmetrically. Damage to the CCL can range from partial fiber tearing to complete rupture, which influences the degree of joint instability. Magnetic resonance imaging (MRI) is considered the gold standard for the diagnosis of CCL injury in people. While MRI findings in dogs with CCL rupture have been described, partial CCL tearing is considered more difficult to diagnose. The purpose of our study was to determine the accuracy of MRI in the identification of CCL complete rupture versus partial tear in dogs.

Methods: 28 client-owned dogs with bilateral naturally occurring CCL disease were recruited. Inclusion criteria included unilateral stifle instability due to CCL damage and a stable contralateral stifle. 3 Tesla MRI of 56 stifles was performed, including three standardized sagittal plane sequences: proton density spin echo, fast spin echo CUBE, and T2 spin echo with fat saturation. Two blinded investigators reviewed the MRI studies. Reviewers marked the CCL as intact, partial, or complete rupture and noted on which sequence it was best seen. Bilateral stifle arthroscopy was performed. The CCL was marked as completely or partially ruptured and the percent fiber loss was reported. MRI evaluation data was compared to the arthroscopic data for statistical analysis.

Results: Arthroscopically, 32.1% of CCLs were completely ruptured and 67.9% were partially torn. The degree of CCL fiber tearing correlated well with the orthopedic assessment of joint instability. Each reviewer correctly identified complete CCL rupture in 77.8% of stifles. Each reviewer falsely identified completely ruptured CCLs as partially ruptured in 22.2% of stifles. All five of the partially torn CCLs falsely identified as complete ruptures had between 70-95% fiber loss and were considered unstable. When considering the diagnosis of a complete CCL rupture, MRI is sensitive (77.8%), specific (86.8-89.5%), has a high PPV (73.7-77.8%), a high NPV (89.2-89.5%), good accuracy (83.9-85.7%), and near perfect interobserver agreement (κ 0.879). The region of the CCL was best seen in the majority of stifles on the CUBE sequence.

Discussion/Conclusion: MRI evaluation of the CCL for partial tearing versus complete rupture is accurate compared with arthroscopic and surgical findings. As a compliment to arthroscopy, MRI may help guide treatment choice in patients with CCL tearing. MRI evaluation of CCL partial tearing versus complete rupture will likely play a key role as potential treatments to limit progressive fiber loss of the CCL are further investigated.
GADOXETATE DISODIUM (EOVIST®) ENHANCED MAGNETIC RESONANCE IMAGING CHARACTERISTICS OF HEPATOCELLULAR CARCINOMA IN DOGS. C. Constant¹, S. Hecht¹, C. Lux¹, C. M. Cannon¹, G. A. Conklin¹, L. E. Craig². ¹Department of Small Animal Clinical Sciences, ²Department of Biomedical and Diagnostic Sciences, University of Tennessee College of Veterinary Medicine, Knoxville, TN 37996.

Introduction/Purpose: Hepatocellular carcinoma (HCC) is the most common primary hepatic neoplasm in dogs. Histopathology is the gold-standard for diagnosis, but requires invasive procedures. A non-invasive method to characterize canine hepatic lesions is desirable. Magnetic resonance imaging (MRI) utilizing the liver specific contrast agent Gadoxetate disodium (Eovist®) improves hepatic lesion detection and characterization in humans. The purpose of this study is to describe the MRI characteristics of canine HCC utilizing Eovist®.

Methods: Eight client-owned dogs were prospectively enrolled. Inclusion criteria were at least one hepatic mass identified on abdominal imaging, with subsequent histopathologic confirmation of HCC. Pre-contrast T1W, T2W, TrueFISP, and VIBE; and post-contrast VIBE (at 0, 1, 5, 10, 15 and 20 min. post injection) and T1W-FS (at 20 min. post injection) sequences were acquired using a 1.5T MRI scanner. Signal characteristics and lesion heterogeneity were subjectively evaluated. Signal intensity ratios (SIR) of lesions compared to normal hepatic parenchyma and wash-in and wash-out parameters were determined on VIBE images.

Results: Eight HCC were identified in 7 dogs. One dog was excluded as a presumed hepatic mass diagnosed on ultrasound was splenic in origin on MRI and surgery. HCC were predominantly hyperintense on T2W and TrueFISP sequences and isointense on pre-contrast T1W and VIBE sequences. Most lesions were hypointense on post contrast VIBE sequences, and all were isointense to hyperintense on T1W-FS sequences. 5/8 lesions were heterogeneous. Moderate contrast enhancement was observed in 7/8 lesions with a median maximum SIR of 0.79 (range 0.50-0.98). Additional hepatic lesions not seen on prior imaging were identified in 3/7 patients.

Discussion/Conclusion: Canine HCC can have variable MR characteristics using Eovist®. The moderate contrast enhancement of lesions based on the SIR values indicates that tumor cells have retained but decreased function compared to normal liver. Additional hepatic lesions not detected on prior imaging were identified in several patients.
Introduction/Purpose: Degenerative lumbosacral stenosis (DLSS) is a common cause of cauda equina syndrome in large breed dogs. Magnetic resonance imaging (MRI) is the preferred method of diagnosis of degenerative lumbosacral stenosis in people and dogs; however, in dogs, correlation with clinical findings has been unreliable. Studies in people have shown that weight loading and dynamic positioning improve identification of pathology causing clinical signs. To the author’s knowledge, dynamic imaging of the lumbosacral spine using MRI in dogs has not been published. The purpose of this study was to investigate dynamic MRI examinations of the lumbosacral joint in dogs with DLSS and to assess for correlation with neurologic exam findings.

Methods: Thirty-four dogs with clinically-suspected lumbosacral stenosis were evaluated by a surgeon and/or neurologist and underwent MRI exam (GE, 1.5 Tesla). Neurologic exam findings assessed pain on hyperextension of hindlimb or tail, pain on palpation of the lumbosacral area, and loss of rear limb strength, muscle tone or anal reflex. Multiplanar T2W-FRFSE sequences were acquired with the patient in neutral, extended and flexed positions. Measurements were obtained from the parasagittal images in all three positions and used to calculate the lumbosacral joint sagittal compression ratio (SCR), lumbosacral step (LSS), lumbosacral canal ratio (LSR) and lumbosacral angle (LSA) as previously described. The SCR was determined using the site of maximal compression at the lumbosacral junction in relation to the vertebral canal height at the midbody of L6. The LSS measured the subluxation of the lumbosacral joint. The LSR determined the difference in the dorsoventral dimension of the spinal canal at the caudal aspect L7 and the cranial aspect of S1. Finally, the LSA was determined as the vertebral canal angle of the lumbosacral joint at the level of the caudal L7 endplate. These results were compared between all three positions for statistical significance.

Results: Technique for dynamic positioning of the lumbosacral spine in MRI was established in this study. There was a statistically significant difference in the LSS and LSA in all three positions and in the SC between neutral and flexed positions. There was not a statistically significant difference in SC between extended and neutral positions or the LSR. Neurologic exam findings could not be correlated with severity of compression.

Discussion/Conclusion: Dynamic positioning for evaluation of the lumbosacral junction in MRI can be consistently performed. In the dogs evaluated in this study, differences in compression were only statistically significant between flexion and neutral positions, suggesting that the neutral position should be adequate to demonstrate compression.

Introduction/Purpose: Distal ulnar ostectomy may be performed palliatively in patients with distal ulnar osteosarcoma. In procedures requiring removal of the ulnar styloid process, arthrodesis of the carpus has been proposed to compensate for joint instability following transection of carpal ligaments. However, successful ostectomies without surgical stabilization of the carpus have been reported anecdotally. The stability of the antebrachiocarpal joint following removal of the styloid process and transection of supporting ligaments has yet to be reported. The objective of this prospective study was to assess stability of the antebrachiocarpal joint following distal ulnar ostectomy (including removal of the styloid process) using stress radiographic views in canine cadaver limbs.

Methods: Ten thoracic limbs were obtained from canine cadavers weighing more than 20 kg. Dogs were excluded if they were chondrodystrophic, immature, or had conformational abnormalities. The entire thoracic limbs were harvested and frozen at -21°C. Limbs were thawed at room temperature for 6 to 12 hours prior to radiographic examination. Lateral and dorsopalmar views as well as stress radiographs, comprising hyperextension, valgus, and varus views, were made before and following 50% distal ulnar ostectomy. Surgical procedures were performed by a board certified small animal surgeon (PA). Antebrachiocarpal joint angle-measurements were made digitally by one investigator (AY) using radiographic viewing software. A paired Student’s t-test was used to compare pre- and post-operative antebrachiocarpal joint angles.

Results: Pre-surgical canine cadaver carpal angle measurements were as follows (mean (SD)): hyperextension 205.9° (5.4), valgus 25.1° (5.7), and varus 13.3° (5.2). In comparison, previously published mean values for carpal angles in live dogs were as follows: hyperextension 190-196°, valgus 12-15°, and varus 5-15°. A significant increase in antebrachiocarpal joint angle was noted following ulnar ostectomy. The mean increase in joint angle was as follows (mean ± SD (CI)): hyperextension 6.2 ± 4.9° (2.6-9.8), valgus 3.2 ± 3.0° (1.0-5.5), varus 6.2 ± 5.2° (2.4-10.1).

Discussion/Conclusion: Cadaver limb joint angles exceeded those previously reported in live dogs. Significant increases in antebrachiocarpal joint angles were noted on hyperextension, valgus, and varus stress radiographs following 50% distal ulnar ostectomy. Changes found in this study suggest antebrachiocarpal instability in patients undergoing distal ulnar ostectomy. Further investigation is warranted in clinical patients to evaluate changes in limb positioning and gait associated with distal ulnar ostectomy.
GLYCOLYTIC PHENOTYPING OF CANINE MAST CELL TUMORS. L.R. Griffin, D. Thamm, E. Ehrhart, A. Marolf, E. Randall. Colorado State University Veterinary Teaching Hospital, 300 W Drake Road, Fort Collins, CO 80523.

Introduction/Purpose: To correlate standard uptake value maximum (SUV\textsubscript{max}), as obtained by F-18 FDG PET-CT, to the grade and metastatic potential of canine mast cell tumors (MCT). This is a pilot study with the primary focus of objectively establishing that more aggressive MCT have an increased reliance on glucose to support their phenotype. This increased reliance on glucose is due to the Warburg effect, where neoplastic cells switch from utilizing oxidative phosphorylation to aerobic glycolysis. The underlying mechanisms and mutations that allow for this switch are currently unknown. If a definitive link between the grade of MCT and the SUV\textsubscript{max} of these tumors can be proven, it would establish canine MCT as an acceptable translational model for further investigation of this phenomenon. It is hypothesized that higher grade, metastatic MCT’s have a higher SUV\textsubscript{max}. If this holds true, genetic profiling of canine MCT may allow for the identification of a mutation that supports this phenotype.

Methods: Dogs were admitted into this study if there was cytologic or histologic confirmation of a cutaneous or subcutaneous MCT. Patients underwent traditional staging (thoracic radiographs, abdominal ultrasound) as well as a full body F-18 FDG PET-CT. After allowing for decay of the F-18 FDG, the primary tumor, any newly identified masses, locoregional lymph nodes and the spleen were sampled. Biopsies of the primary tumor were submitted for histologic grading and a validated immunohistochemical MCT profile. Grades of MCT were categorized as high grade or low grade and SUV\textsubscript{max} of the tumors were determined and compared to evaluate for statistical significance. Other markers of proliferation and aggressiveness (such as Ki-67, \textit{c-kit} mutation status and KIT protein distribution) were also examined.

Results: A total of 10 dogs were evaluated. Due to the small numbers admitted, there was no statistical correlation between MCT grade, \textit{c-kit} status or proliferation markers to SUV\textsubscript{max}. A trend toward higher grade tumors having a higher SUV\textsubscript{max} was established. Splenic SUV\textsubscript{max} did not correlate with presence of splenic mastocytosis. F-18 FDG PET-CT allowed for identification of multiple suspicious regions over traditional staging methods (ie. allowed for upstaging).

Discussion/Conclusion: There may be a relationship between SUV\textsubscript{max} measurements, as obtained by F-18 FDG PET CT, and primary tumor grade and aggressiveness in dogs with cutaneous or subcutaneous MCT. Further studies are needed. As a follow up to this initial pilot project, funds are being acquired to allow for gene-expression profiling of the biopsies already obtained from these patients. In doing so, it is hoped that molecular pathways associated with differences in glucose utilization can be identified. This could, in turn, establish novel therapeutic targets that could be investigated.

Introduction/Purpose: Ultrasound is commonly used in the standard veterinary care of domestic ferrets, but there is minimal information regarding normal ultrasonographic values of this species. The goal of this study was to document the ultrasonographic characteristics of the urogenital system in presumed healthy domestic ferrets (*Mustela putorius furo*).

Methods: Healthy ferrets, without history of prior illness, were prospectively recruited. To ensure the ferrets were healthy at the time of imaging, a physical exam, serum biochemistry, complete blood count, and urinalysis were performed. Follow-up client communication confirmed ferrets remained healthy after imaging (mean 15 d). Abdominal ultrasound was performed by a single board certified radiologist (JNS). Images were evaluated for renal echogenicity, length, hilar width and height, cortical thickness, pulsatility (PI) and resistive indices (RI), the presence of renal cysts, pelvic dilation, urinary bladder distension and wall thickness, and prostatic and testicular length, height and width.

Results: 55 ferrets were included (Mc 26, Mi 8, Fs 20, Fi 1) with a median age of 1.9 yr (range 0.3 – 4.2 yr). Renal cortices were hyperechoic to the liver (55/55) and hypoechoic (27/55), isoechoic (15/55), or hyperechoic (12/55) to the spleen. Mean renal size measurements were: length 29.0 ± 2.4 mm; hilar height 12.0 ± 1.5 mm; hilar width 13.5 ± 1.6 mm and cortical thickness 2.7 ± 0.4 mm. There was a significant positive correlation between all renal size parameters and weight ($p < 0.0001$). Mean RI was 0.59 ± 0.09. Median PI was 0.97 (range 0.56 – 1.84). Renal cysts were present in at least one kidney in 34/55 ferrets, of which 8 had bilateral cysts. The presence of renal cysts was not associated with kidney size, RI or PI. Pelvic dilation (mean 1.0 ± 0.4mm) was observed unilaterally in 9/55 ferrets and bilaterally in 1/55. Renal width was larger in kidneys with pelvic dilation ($p = 0.009$). Median bladder wall thickness was 0.45 mm (range 0.29 – 0.69 mm). Bladder wall thickness was not significantly associated with the degree of bladder distension.

Prostate glands were larger in intact males ($p < 0.002$); mean length was 15.3 ± 2.3 mm, height was 4.1 ± 0.6 mm, and width was 5.0 ± 0.9 mm. For castrated males mean length was 12.4 ± 2.1 mm, median height was 1.9 mm (range 1.4 – 3.1 mm), and mean width was 2.3 ± 0.5 mm. Mean testicular length was 17.9 ± 2.8 mm, height was 12.3 ± 2.9 mm, and width was 13.8 ± 2.5 mm.

Discussion/Conclusion: This study provides reference guidelines for ultrasonographic evaluation of the urinary tract and male genital tract of presumed healthy ferrets. Additional studies including more intact ferrets, particularly females, are required for further characterization.

Introduction/Purpose: Radiographs and ultrasound are part of the standard of veterinary care in ferrets, but there is a dearth of information for what is considered normal in this species. The goal of this study was to evaluate the spleen and abdominal lymph nodes on radiographs and with ultrasound in presumed healthy domestic ferrets (*Mustela putorius furo*).

Methods: Ferrets between 4 mo and 4 yrs old (mean 1.9 ± 1.0 yr) with no history of illness were prospectively recruited. To assess health a physical exam, complete blood count, chemistry panel, and urinalysis were performed at the time of imaging. Follow-up client communication was also performed after imaging (mean 15 days) in an attempt to detect occult illness. Imaging included three-view whole body radiographs and abdominal ultrasonography. On radiographs splenic and abdominal lymph node visibility was assessed. With ultrasound splenic thickness and echogenicity and lymph node length, thickness, echogenicity, number, and presence of cysts were recorded. Of 112 ferrets, 55 were included, including 34 males (26 neutered) and 21 females (20 neutered). Sedation was performed in 32/55 of ferrets to facilitate the procedures.

Results: The spleen was radiographically identifiable in all ferrets. The spleen could be seen along the ventral abdomen in 21/55 (38%) of ferrets. On ultrasound the spleen was hyperechoic to the liver (55/55) and mildly hyperechoic (28/55), isoechoic (15/55), or mildly hypoechoic (12/55) to the renal cortices. It had a homogeneous echotexture in 38/55, was mildly mottled in 12/55, and had few ill-defined, hypoechoic nodules in 5/55. Splenic thickness ranged from 8.16 – 17.70 mm (mean ± SD: 11.80 ± 0.34 mm) and was positively associated with age ($p < 0.001$).

At least one lymph node was radiographically discernable in 36/55 (65%) ferrets; visualized lymph nodes included the caudal mesenteric (lateral view 24/55), sublumbar (lateral view 6/55), and inguinal lymph nodes (lateral view 3/55; VD view 14/55). With ultrasound an average of 9 lymph nodes (SD ± 2; mode 10) were identified in each ferret. Lymph nodes detected with ultrasound included jejunal (also known as mesenteric), pancreaticoduodenal, hepatic, caudal mesenteric, splenic, gastric, medial iliac, and lumbar aortic lymph nodes. A single large jejunal lymph node was identified in all ferrets and had a mean thickness of 5.28 ± 1.66 mm. For other lymph nodes the mean thickness measurements plus one standard deviation were less than 4.5 mm (95% CI: < 3.6 mm). Most lymph nodes had a hyperechoic hilus and hypoechoic rim.

Discussion/Conclusion: This study provides reference guidelines for radiographic and ultrasonographic evaluation of the spleen and abdominal lymph nodes in presumed healthy ferrets.
Introduction/Purpose: Ultrasonography of intrathoracic mass lesions is limited to peripheral pulmonary or mediastinal structures due to overlying aerated lung lobes and bone. The use of contrast-enhanced ultrasonography (CEUS) to characterize abdominal organ pathology in dogs and cats has been reported. The purpose of this study was to assess the feasibility of CEUS to characterize pulmonary and mediastinal masses in the dog and cat and to determine whether CEUS could distinguish between benign and malignant intrathoracic mass lesions.

Methods: Dogs and cats with intrathoracic mass lesions seen on thoracic radiographs were included in this prospective study. Ultrasonographic imaging of the intrathoracic masses determined the structures as pulmonary or mediastinal in origin. The patients were then examined by CEUS and images were acquired with a low mechanical index setting (MI) of 0.05 – 0.11 following injection of SonoVue®. Each patient received a bolus injection of 1-2 ml contrast medium followed by 3-5 ml of saline solution. Early phase (<120 sec) and late phase (>120 sec) enhancement-patterns were recorded. Using region-of-interest (ROI) generated signal intensity (SI) time curves, time to peak intensity (TTP), time to enhancement (TTE), maximum SI, and wash out time were measured. The values were statistically evaluated using a linear mixed effects model, multinomial regression, and t-test. These measurements were compared to those of the uniformly enhancing, systemically perfused spleen. Ultrasound-guided FNA and/or tissue core biopsy was performed in all cases.

Results: Fifteen patients (8 dogs and 7 cats) showed intrathoracic mass lesion on thoracic radiographs. Ultrasonography determined 10 pulmonary masses (67%) and 5 mediastinal masses (33%). TTE values showed a significant difference between carcinomas and sarcomas (p = 0.026) and between carcinomas and inflammatory lesions (p = 0.012). Multinomial regression classification showed that the dependant variable for pulmonary carcinomas was TTE (κ = 0.841; p< 0.001). There was a significant correlation between intrathoracic neoplasia and TTE values (Sig 2-tailed = 0.001), as opposed to non-neoplastic masses. Ultrasound-guided FNA was performed in 13 animals and tissue core biopsies in 7 patients. More than one diagnostic procedure was applied in some patients. Of the pulmonary masses 3/10 were adenocarcinomas (30%), 2/10 undifferentiated carcinomas (20%), 1/10 adenosquamous carcinoma (10%), 1/10 spindle cell sarcoma (10%), 2/10 inflammatory lung tissue (20%), and 1/10 abscess (10%). 3/5 mediastinal masses were thymomas (60%), 1/5 mediastinal lymphoma (20%), and 1/5 lymphangiosarcoma (20%).

Discussion/Conclusion: CEUS provides useful information to characterize peripheral pulmonary and mediastinal mass lesions.
ULTRASOUND QUALITY ASSURANCE PROGRAMS: A PILOT SURVEY OF VETERINARY SONOGRAPHERS. L.P. Hoscheit, H.G. Heng, C.K. Lim, H.Y. Weng. Purdue University, 47907.

Introduction/Purpose: Quality assurance programs for ultrasound (QAP) are comprised of quality control and quality acceptance testing. A great deal of information exists in the human medical, and medical physics literature, regarding QAP and the potential for diminished diagnostic quality of scans performed with suboptimal performing equipment. The effectiveness of ultrasound phantoms (UP), in both QAP and in evaluating ultrasound image performance e.g. spatial resolution, is well document, as is the ineffectiveness of clinical scans for QAP. The American College of Radiologists (ACR) requires QAP, using UP, for Ultrasound accreditation and Breast Ultrasound accreditation. To the authors knowledge, nothing exists in the veterinary literature regarding QAP, or the importance of UP in both QAP and for evaluation of image quality performance. The purpose of this study was to ascertain the prevalence of, and the methods utilized in QAP amongst veterinary sonographers (VS). We hypothesized that the majority of VS did not have a QAP in place, or were unaware of QAP, and did not use ultrasound phantoms for QAP.

Methods: 1497 members of veterinary diagnostic imaging organizations, were emailed a link to the electronic survey (Qualtrics™ survey). (ACVR Diplomates: 545, Veterinary Ultrasound Society members: 302, EAVDI members: 650). Questions included in the survey: 1) Is a quality control program in place for your ultrasound equipment? 2) Is quality control performed using a phantom 3) Is quality testing acceptance testing in place for ultrasound equipment? 4) Is quality testing acceptance testing performed using a phantom?

Results: The response rate was 11%. Responses to questions: 1) The majority (74%) answered no or don’t know. 2) The majority (63%) responded no or don’t know. 3) The majority (58%) responded no or don’t know. 4) The majority (90%) responded no or don’t know.

Discussion/Conclusion: The results support the hypothesis, and indicate further education regarding the importance of QAP, the use of UP, and the ineffectiveness of clinical scans for QAP is warranted. Further investigation into the potential clinical significance resulting from diminished diagnostic quality as a result of the low frequency of QAP amongst VS may be warranted. VS would likely benefit from further education regarding the parameters of image performance which can be evaluated with UP, and the potential use of UP as an objective means of comparing ultrasound equipment prior to purchasing decisions. The author suggests VS consider adopting guidelines for QAP outlined by several organizations including: the ACR, the American Association of Physicists in Medicine, the American Institute of Ultrasound in Medicine, and the Institute of Physical Sciences in Medicine.
EVALUATION OF THYROID UPTAKE OF 99M PERTECHNETATE FOR DIAGNOSIS AND STAGING OF DISEASE SEVERITY IN CATS WITH HYPERTHYROIDISM. M.E. Peterson1,2, J.N. Guterl1, M. Rishniw2, M.R. Broome3. 1Animal Endocrine Clinic, New York, NY 10025; 2Cornell University, Ithaca, NY 14853; 3Advanced Veterinary Medical Imaging, Tustin, CA.

Introduction/Purpose: Thyroid scintigraphy is commonly used in diagnosis and staging of hyperthyroidism, with the thyroid-to-salivary ratio (T/S) being the most common method to quantify the degree of thyroid activity and disease. Calculation of the percent thyroidal uptake of 99mTcO-4 (TcTU) has only been reported in a few studies with small numbers of cats. Our purpose was to evaluate use of TcTU in a large number of hyperthyroid cats to compare it to other more common parameters calculated with quantitative scintigraphy.

Methods: This study included cats (n=451) referred to the Animal Endocrine Clinic over an 18-month period for evaluation of suspected hyperthyroidism. All cats had serum T4, T3, free T4, and TSH determined, as well as qualitative thyroid scintigraphy, in order to confirm or exclude hyperthyroidism. Results confirmed hyperthyroidism in 432 cats and showed 19 to be euthyroid; 80 clinically normal cats (≥7 years) were recruited as controls. Scintigraphy was performed by injecting 111-148 MBq of 99mTcO-4 into the saphenous vein. 60-second static images of the dose syringe and injection apparatus were acquired by the gamma camera immediately prior to and following injection. One hour after 99mTcO-4 injection, 60-sec ventral and lateral static images were acquired (camera fitted to LEAP collimator). TcTU (net thyroid counts divided by counts injected) was calculated after correcting thyroid counts for decay, background, and thyroid depth.

Results: The %TcTU in hyperthyroid cats (3.2%) was ten-fold higher than in clinically normal (0.37%) or euthyroid suspect cats (0.39%; P < 0.001). Of the hyperthyroid cats, 419 (97%) had high TcTU values, whereas all 19 euthyroid cats referred for suspected hyperthyroidism had normal values. Cats with bilateral (4.0%) and multifocal thyroid disease (25.2%) had higher TcTU values than did cats with unilateral disease (3.0%; P < 0.05). Of the 13 hyperthyroid cats with normal TcTU, 9 (69%) had unilateral disease, and all cats with normal TcTU values had relatively mild hyperthyroidism (T4 <7.0 µg/dl). In hyperthyroid cats, the TcTU correlated significantly with T/S ratio (r=0.85). However, compared with the T/S, the TcTU had a higher and more significant correlation (P < 0.01) with estimated thyroid volume (r=0.62 vs. 0.38), T4 values (r=0.76 vs. 0.64), and T3 concentrations (r = 0.77 vs. 0.64).

Discussion/Conclusion: Calculation of percent thyroid uptake of 99mTcO-4 (TcTU) is a sensitive and specific test for hyperthyroidism. Of all of the quantitative parameters measured (T/S and thyroid-to-background ratios), TcTU correlated highest to the metabolic activity of the gland based on serum T4 and T3 values. The TcTU also correlated best with the estimated thyroid volume. Therefore, in addition to confirming the diagnosis, use of TcTU could aid in determining the optimal radioiodine dose for effective treatment of hyperthyroidism.
Saturday, October 10, 2015

7:00 am  Registration Opens  4th Floor Registration

7:00 - 7:50 am  CT/MRI Society Meeting  Ballroom 1-2

7:50 - 8:00 am  Announcements  Ballroom 1-2
Dr. Mauricio Solano, Program Chair

8:00 - 9:00 am  CT/MRI Keynote Speaker  Ballroom 1-2
*Idiopathic Interstitial Pneumonias and Diffuse Infiltrative Lung Disease CT Patterns and Radiopathologic Correlation*
Dr. Tadashi Allen MD, ABR, University of Minnesota

9:00 am  Scientific Session 6  Ballroom 1-2

9:00 - 9:12 am  **FELINE INJECTION SITE SARCOMA: COMPUTED TOMOGRAPHIC INVESTIGATION OF TUMOR DENSITY.** K. M. Zardo, A. C. B. C. Fonseca-Pinto, L. P. Damiani, J. M. Matera. School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, SP, Brazil, 05508-270.


9:36 - 9:48 am  **RADIOGRAPHIC AND COMPUTED TOMOGRAPHIC FEATURES OF FELINE MYCOBACTERIOSIS.** T. Schwarz, A. Major, D. Gunn-Moore. Royal (Dick) School of Veterinary Studies and The Roslin Institute, The University of Edinburgh, Roslin, Midlothian, EH25 9RG, UK.

9:48 - 10:00 am  **CORRELATIONS BETWEEN COMPUTED TOMOGRAPHIC AND HISTOLOGIC FEATURES OF FELINE NASOPHARYNGEAL POLYPS.** C.R. Lamb, K. Sibbing, S.L. Priestnall. The Royal Veterinary College, University of London, U.K.

10:00 - 10:30 am  Break with Exhibitors  Ballroom 3-4
10:30 - 10:42 am  EVALUATION OF THE FEASIBILITY OF PERFORMING ECG-GATED 64-ROW CARDIAC MDCT IN HEALTHY SPONTANEOUSLY BREATHING SEDATED DOGS USING A TRI-PHASIC CONTRAST INJECTION PROTOCOL.  S. M. Stieger-Vanegas, N. LeBlanc, K. F. Scollan. Department of Clinical Sciences, College of Veterinary Medicine, Oregon State University, Corvallis, OR 97331.


10:54 - 11:06 am  COMPARISON OF RADIOGRAPHIC FEATURES IN MITRAL REGURGITATION WITH OR WITHOUT PULMONARY HYPERTENSION IN DOGS.  S.K Lee, J.H. Choi. College of Veterinary Medicine, Chonnam National University, Gwangju 500-757, South Korea.

11:06 - 11:18 am  A LOW COST CLOUD-BASED PACS USING OPEN-SOURCE SOFTWARE AND AMAZON WEB SERVICES.  R.C. McLear, Petrad LLC, Swarthmore, PA 19081.

11:18 – 11:30 am  FEASIBILITY OF A NOVEL GI IMAGING DEVICE FOR USE IN DOGS.  B.T. Hardy¹, A. Sharma², J.A. Solomon¹. Infiniti Medical LLC, Menlo Park, CA, 94025¹ College of Veterinary Medicine, University of Georgia, Athens, GA 30602².

11:30 - 12:30 pm  Scientific Posters (Authors by the Posters)  Atrium

12:30 - 1:30 pm  Lunch on Your Own

1:30 - 3:00 pm  Interventional Radiology CE  Ballroom 1-2  IR for Radiologists…A Primer (What you didn’t learn in your residency.)  Dr. Chick Weisse, VMD, DACVS

3:00 - 4:30 pm  Cone Beam CT Forum  Ballroom 1-2  Drs. Tobias Schwartz, Ana Caceres, Robert O’Brien, Bryan J. Stephens

4:30 - 4:35 pm  Meeting Concludes  Dr. Mauricio Solano, Program Chair
FELINE INJECTION SITE SARCOMA: COMPUTED TOMOGRAPHIC INVESTIGATION OF TUMOR DENSITY. K. M. Zardo, A. C. B. C. Fonseca-Pinto, L. P. Damiani, J. M. Matera. School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, SP, Brazil, 05508-270.

Introduction/Purpose: Feline injection site sarcomas (FISS) are mesenchymal neoplasms with highly invasive behavior. Attenuation values (Hounsfield Units, HU) of such lesions have been seldom reported and fall within the soft tissue range. The aim of this study was to assess the computed tomographic density of tumoral tissues based on histograms obtained before and after administration of intravenous contrast medium, and to determine common FISS attenuation values.

Methods: Ten cats diagnosed with FISS were used in the prospective and retrospective phases of the study. Computed tomographic images were acquired using single-slice CT scanner and imported into DICOM viewer for determination of tumor HU values; HU values were then imported into statistical software for histograms generation.

Results: Mean attenuation values were significantly (p = 0.002) higher in post-compared to pre-contrast CT images. Histograms tended to produce two peaks: a broader peak in the fat attenuation range (-120 to -80 HU) and a narrower, higher peak in the positive attenuation range (50 to 100 HU) (Figure 1). Curves were slightly skewed to the right in the post-contrast phase (Figure 2); relatively stable attenuation ranges (0 to 20 HU) were observed in both phases.

Discussion/Conclusion: Attenuation value histograms provided a general overview of tumor tissue composition. A common FISS attenuation profile could be described, which may however be impacted by lesion site, tumor histotype and degree of malignancy.

Introduction/Purpose: In dogs with large primary tumors, regional lymph node involvement or evidence of distant metastasis can have worse prognoses and significantly decreased survival times. Lymph node size without cytologic or histopathologic examination has been shown to be insufficient for the accurate clinical staging of some canine neoplasia, including oral malignant melanoma. However, regional lymph nodes of the oral cavity, such as the medial retropharyngeal lymph nodes, are difficult to access for routine sampling. Diffusion weighted magnetic resonance imaging (DWMRI) has demonstrated the ability to differentiate metastatic from inflammatory/benign lymph nodes in clinical studies with human cancer patients. The purpose of this study is to determine if DWMRI can differentiate between metastatic and benign lymph nodes in a group of canine patients with head or neck disease.

Methods: Canine patients with head or neck disease and at least one enlarged regional (mandibular or medial retropharyngeal) lymph node were prospectively recruited. MR images were obtained including T2-W, STIR, diffusion weighted, and T1-W (pre- and post-contrast) sequences, with apparent diffusion coefficient (ADC) images then created. Biopsy samples of every enlarged lymph node and fine needle aspirate samples of any other accessible normal sized lymph nodes were obtained. Every lymph node was placed into one of two categories (metastatic or benign) based on cytologic/histopathologic classification. Regions of interest were drawn on the MR images, encircling the enlarged and any sampled normal sized lymph nodes in order to calculate a mean ADC value for each lymph node.

Results: Five dogs have met inclusion criteria thus far for this ongoing study. After individually calculating a mean ADC value for each node, mean ADC values were calculated for each of the two lymph node categories (metastatic and benign). The mean ADC value for the metastatic group was found to be $0.577 \times 10^{-3} \text{ mm}^2/\text{s}$ while that of the benign group was found to be $0.964 \times 10^{-3} \text{ mm}^2/\text{s}$.

Discussion/Conclusion: The results of this study thus far demonstrate a trend that mean ADC values of metastatic lymph nodes are lower than those of benign lymph nodes. These results suggest that diffusion weighted MRI may have the ability to differentiate between metastatic and benign lymph nodes. Though more research is necessary, diffusion weighted imaging may provide a non-invasive, image based method of lymph node characterization that could prove a useful tool in the staging and therapeutic monitoring of veterinary cancer patients.

Introduction/Purpose: Increased signal and size of the canine supraspinatus tendon has been described on MRI, and has been related to fiber disruption and edema1. However, this appearance is seen in tendons of clinically sound dogs. The purpose of this study was to correlate increased MR signal to the cellular and extracellular matrix components of this region using histology.

Methods: 14 shoulders were obtained from an unrelated IACUC-approved study and scanned on a clinical 3T unit (GE Healthcare, Waukesha, WI) with an 8 channel wrist coil (Invivo, Gainesville, FL). FSE images were acquired: echo time: 24-100 ms, repetition time: 4000 ms, bandwidth: 62.5 kHz, matrix: 384x384, number of excitations: 3, field-of-view: 10 cm, slice: 2.0 mm. The supraspinatus insertion and adjacent bone were fixed in 10% neutral buffered formalin, decalcified in formic acid/NaCl solution, and processed to paraffin on a Shandon Processor. 6 µm sections were generated on a rotary microtome and stained with hematoxylin and eosin (H&E).

Results: Inspection of the tendon demonstrated no hemorrhage, edema or tear. A consistent hyperintense signal was seen at the broad attachment on the greater tubercle on T2 and proton density (PD) weighted images (Fig 1A/B). Tendon fibers were seen as a linear band of low signal intensity (Figure 1A arrows). Histologically, the increased signal correlates to a fibrocartilaginous enthesis (Figure 1C * and inset).

Discussion/Conclusion: A fibrocartilaginous enthesis reflects mechanical adaptation at a tendon insertion, and contains four zones: pure dense fibrous connective tissue, uncalcified fibrocartilage, calcified fibrocartilage and bone2. Signal variation of the fibrocartilage likely reflects variability in relative water content as well as lack of uniform collagen orientation as is seen in the tendon proper (Fig 1A/C arrows). It could be perhaps argued that signal elicited from this region with lack of avulsion, fluid dissection, or disruption of the collagenous tendon fibers may represent a normal tendon and enthesis. References 1: Fransson et al. J Am Vet Med Assoc. 2005;227:1429-33. 2: Benjamin et al.J Anat. 2006 Apr;208(4):471-90.
**Introduction/Purpose:** Tuberculous mycobacteria such as *M. bovis* and *M. microti*, as well as non-tuberculous mycobacteria such as *M. avium*, are increasingly recognized as pathologic agents in cats. This is a worldwide phenomenon, and is a particular concern in the British Isles. The route of infection determines the initial manifestation of disease such as ingestion for alimentary disease, inhalation for respiratory disease and fight-and-bite injuries for cutaneous disease. Haematogenous dissemination of disease can then lead to a variety of clinical signs including dyspnoea, and non-specific signs such as weight loss and anorexia. Purpose of this study was to review the radiographic and computed tomographic (CT) features of cats with confirmed mycobacteriosis.

**Methods:** Radiographic (part 1) and CT studies (part 2) of diagnostic quality of cats with confirmed mycobacteriosis were blindly reviewed for head, skeletal, thoracic or abdominal imaging abnormalities. In both study parts a detailed scoring system was used and confirmation of diagnosis was achieved via Ziehl-Neelson histologic staining, tissue culture, interferon-gamma release assay and/or PCR.

**Results:** Included were 33 radiographic and 20 CT cases. Infection was seen most frequently in adult neutered male cats caused by *M. microti* and *M. bovis*. Radiographic changes affected the thorax most commonly, consisting of bronchial (11/24), alveolar (9/24), nodular unstructured interstitial (9/24) or unstructured interstitial (6/24) lung patterns, often mixed. Perihilar or sternal lymphadenopathies were common (10/24). Skeletal changes were found in the distal antebrachium (3), pes (2), maxilla, scapula, spine, manus, femur, tarsus (1 each) and typically osteolytic (8/11). Abdominal changes such as hepatomegaly and hepatosplenomegaly were rare. CT abnormalities were most commonly seen in the thorax, consisting of bronchial (9/20), alveolar (8/20), ground glass (6/20) or structured interstitial (15/20) lung patterns and lymphadenomegaly were common (16/20). Less common were abdominal (8/13) or peripheral (10/18) lymphadenomegaly, hepatosplenomegaly (7/13), mixed osteolytic/osteoproliferative skeletal lesions (7/20), and cutaneous or subcutaneous masses (4/20).

**Discussion/Conclusion:** Most radiographic and computed tomographic changes seen here represent multi-systemic disease, with pulmonary infiltration, lymphadenomegaly and organomegaly which are also seen in other feline diseases, such as neoplasia (lymphoma or mast cell disease), chronic inflammation/infectious processes (feline infectious peritonitis or systemic mycosis), hypereosinophilic syndrome and amyloidosis. Mycobacteriosis should be considered as a differential diagnosis in such cases. In patients with diagnosed mycobacteriosis the potential for widespread clinical and sub-clinical abnormalities must be considered and investigated in full. Radiography is an efficient general screening tool but computed tomography allows a more comprehensive and detailed assessment of the disease process.
CORRELATIONS BETWEEN COMPUTED TOMOGRAPHIC AND HISTOLOGIC FEATURES OF FELINE NASOPHARYNGEAL POLYPS. C.R. Lamb, K. Sibbing, S.L. Priestnall. The Royal Veterinary College, University of London, U.K.

**Introduction/Purpose:** Feline nasopharyngeal polyps are inflammatory masses that arise from the mucosa of the feline tympanic membrane, auditory tube or nasopharynx. In post-contrast computed tomographic (CT) images, feline nasopharyngeal polyps typically demonstrate enhancement of the peripheral rim; however, the features of polyp structure that contribute to rim enhancement have not been elucidated. The aim of the present study was to review CT and histologic features in a series of feline nasopharyngeal polyps in order to determine the basis of rim enhancement.

**Methods:** Medical records (2008–2014) were searched for cats that had CT of the head and histologic diagnosis of nasopharyngeal polyp. CT images considered suitable for examination of polyps were obtained before and 60s after injection of 2ml/kg iohexol and reconstructed using a medium frequency (soft tissue) algorithm. CT images were reviewed with respect to appearance of the bulla in bone images, and extent of the rim and median attenuation (Hounsfield units, HU) of core and periphery of the polyp in pre- and post-contrast images. Histologic specimens were reviewed independently with respect to the type of epithelium, degree of epithelial injury, and grades of vascularization, edema, hemorrhage, and inflammatory infiltrate affecting the core and superficial stroma. Correlations between HU values in CT images and histologic grades were tested using Spearman’s rank-order correlation coefficient (ρ).

**Results:** Twenty-two cats had CT and diagnosis of polyp. Polyps were in the tympanic cavity in 15 (68%) cats (9 with extension into the external ear canal; 3 with extension into the nasopharynx, and one with polyp extension into both nasopharynx and external ear canal), only in the nasopharynx in 4 (18%) cats, and only in the external ear canal in the remaining 3 (14%) cats. In non-contrast CT images (n=22), the tympanic bulla was thickened in 15 (100%) cats with a polyp in the tympanic cavity and enlarged in 8 (73%) of these cats. In post-contrast CT images (n=15), an outer zone of increased attenuation compatible with a rim was observed in 11 (73%) polyps. All polyps examined histologically had variable degrees of epithelial injury. Hemorrhage and inflammation were more marked in the superficial stroma whereas edema was more marked in the core stroma. Significant positive correlations were found between pre-contrast HU and grade of inflammation in core stroma of polyps (ρ=0.63, p=0.01), post-contrast HU of the rim and grade of inflammation in superficial stroma (ρ=0.53, p=0.04), and the increase in post-contrast HU of the rim and grade of inflammation in superficial stroma (ρ=0.60, p=0.02). The extent of the rim was positively correlated with grade of inflammation in superficial stroma (ρ=0.52, p=0.04) and negatively correlated with grade of edema in superficial stroma (ρ= -0.53, p=0.04).

**Discussion/Conclusion:** It appears that inflammation is the major determinant of contrast medium accumulation in feline nasopharyngeal polyps, and the tendency for inflammation to affect predominantly the superficial stroma explains the frequent observation of a rim in post-contrast CT images.
EVALUATION OF THE FEASIBILITY OF PERFORMING ECG-GATED 64-ROW CARDIAC MDCT IN HEALTHY SPONTANEOUSLY BREATHING SEDATED DOGS USING A TRI-PHASIC CONTRAST INJECTION PROTOCOL. S. M. Stieger-Vanegas, N. LeBlanc, K. F. Scollan. Department of Clinical Sciences, College of Veterinary Medicine, Oregon State University, Corvallis, OR 97331.

Introduction/Purpose: Electrocardiogram (ECG)-gated multidetector computed tomography (MDCT) is an excellent technique to evaluate cardiac anatomy and function. Performing cardiac MDCT studies under anesthesia may limit its application in dogs with underlying cardiac disease due to increased anesthetic risk. The aim of our study was to evaluate image quality, sedation protocol, and overall feasibility of cardiac MDCT for visualization of the cardiac chambers in sedated compared to anesthetized healthy dogs.

Methods: This was a prospective study performed in 6 healthy dogs that underwent two ECG-gated cardiac MDCTs, once using sedation with spontaneous breathing and once under general anesthesia with suspended breathing using a tri-phasic contrast agent injection protocol. All dogs were free of cardiac disease based on normal echocardiographic exams. One radiologist and 2 cardiologists qualitatively and quantitatively evaluated the normal anatomic structures of the heart. Additionally image quality, breathing/motion artifacts, and adverse events were recorded.

Results: Two dogs in the sedated group had insufficient contrast present in the right heart for evaluating right- and left-sided structures simultaneously. There was no significant difference in the mean image quality between the sedated and anesthetized cardiac MDCTs. The degree of respiratory motion observed in the sedated dogs was minimal and did not limit diagnostic evaluation of the heart. A similar degree of streaking artifact was observed in both groups and resulted in lack of visualization of the tricuspid valve.

Discussion/Conclusion: Cardiac MDCT can be performed in sedated dogs with spontaneous breathing. Image quality during MDCTs with spontaneous breathing is excellent, and there is high accuracy compared with anesthetized suspended breathing cardiac MDCT. Echocardiography will likely continue to be the first imaging modality to evaluate congenital and acquired heart disease; however in dogs where additional imaging is beneficial, sedated MDCT with spontaneous breathing may be a feasible non-invasive option to further evaluate cardiac structure and function.
ULTRASONOGRAPHIC AND COMPUTED TOMOGRAPHIC CHARACTERIZATION AND LOCALIZATION OF SUSPECTED MECHANICAL OBSTRUCTION IN DOGS.


Introduction/Purpose: To describe the findings and time required for non-contrast abdominal computed tomography (CT) compared to abdominal ultrasonography (US) in the diagnosis and localization of mechanical GI obstruction in dogs. A secondary goal was to report and compare intestinal diameter ratios between obstructed and non-obstructed dogs.

Methods: Sixteen client-owned dogs enrolled had physical examination and radiographic findings consistent with obstructive GI disease. All dogs underwent abdominal US and CT followed by abdominal exploratory surgery. The time required for image acquisition, presence or absence of GI obstruction and location of the obstruction were evaluated for both modalities. Maximum and minimal intestinal diameters were recorded on CT studies. Abdominal exploratory surgery findings were used as the standard. Intestinal diameter ratios derived from CT of obstructed and non-obstructed dogs were compared.

Results: Abdominal CT and surgical exploratory agreed on the presence of obstruction in all 16 dogs; thirteen (81.2%) dogs were obstructed, completely (n=10) or partially obstructed (n=3) and three (18.8%) dogs were not obstructed. In one dog abdominal US incorrectly diagnosed a mechanical obstruction in a dog with a functional ileus. Image acquisition was markedly faster (p=0.0001) for abdominal CT (2.5, 2.0 - 3.8) compared to US (26, 22.0 - 35.8) mins. Dogs with GI obstruction had significantly larger GI diameters than dogs without GI obstruction in both the dorsal (p=0.037) and transverse planes (p=0.013).

Discussion/Conclusion: Abdominal CT is a feasible, rapid and potentially more accurate diagnostic modality in determining the presence of mechanical obstruction in dogs presenting with clinical signs and physical examination findings consistent with partial or complete GI obstruction.
COMPARISON OF RADIOGRAPHIC FEATURES IN MITRAL REGURGITATION WITH OR WITHOUT PULMONARY HYPERTENSION IN DOGS. S.K Lee, J.H. Choi. College of Veterinary Medicine, Chonnam National University, Gwangju 500-757, South Korea.

Introduction/Purpose: Mitral regurgitation is reported as the most common cause of pulmonary hypertension in dogs. Mitral regurgitation can be diagnosed with auscultation, radiography and echocardiography however it is difficult to predict whether pulmonary hypertension is accompanied until confirmed with echocardiography. The purpose of this study was to evaluate radiographic features in mitral regurgitation with pulmonary hypertension in dogs and compare them without pulmonary hypertension.

Methods: A total of 218 dogs diagnosed with mitral regurgitation on echocardiography from Jan. 2013 to Dec. 2014 were divided into two groups according to secondary pulmonary hypertension. Medical records and thoracic radiographs were reviewed and the severity of mitral regurgitation and pulmonary hypertension were assessed based on echocardiographic records. Pulmonary hypertension only secondary to mitral regurgitation was included in this study. On radiography, the size and shape of each cardiac chamber, main pulmonary artery, cranial and caudal pulmonary vessels and the degree of pulmonary infiltration were evaluated.

Results: About 51.8% of dogs (n=113) with mitral regurgitation had pulmonary hypertension. The incidence of pulmonary hypertension was correlated with severity of mitral regurgitation. Weak positive correlation was found between severity of mitral regurgitation and pulmonary hypertension ($r=0.338$, $P=0.00$). All dogs showing main pulmonary arterial bulging or tortuous change of peripheral pulmonary vessels had pulmonary hypertension. The size of cranial pulmonary artery and vein, and the ratio of caudal pulmonary artery to vein were correlated with occurrence of pulmonary hypertension although only weak positive correlation was found. The most useful factor for prediction of pulmonary hypertension was right caudal pulmonary artery to vein ratio, but its sensitivity and specificity were low; a cut-off of 0.79 and area under the curve of 0.723 had 80% sensitivity and 45% specificity and cut-off of 0.93 had 45% sensitivity and 80% specificity.

Discussion/Conclusion: Pulmonary hypertension secondary to mitral regurgitation could not be predicted based on the radiographic changes in dogs, although the ratio of the right caudal pulmonary artery to vein in mitral regurgitation with pulmonary hypertension tended to be higher than dogs without pulmonary hypertension. However, bulging of main pulmonary artery and tortuous change of pulmonary vessels could be used as specific radiographic features for pulmonary hypertension.
A LOW COST CLOUD-BASED PACS USING OPEN-SOURCE SOFTWARE AND AMAZON WEB SERVICES. R.C. McLear, Petrad LLC, Swarthmore, PA 19081.

Introduction/Purpose: The widespread adoption of digital imaging in the veterinary community has created a market for imaging companies to provide high-end PACS servers to large hospitals and academic institutions. A need was perceived for a PACS system designed specifically for use by smaller veterinary practices and independent radiologists. The goals of the project were to produce a cloud-based PACS which is vendor-independent, easily deployable, and provides high data security and redundancy, while minimizing costs of deployment and use.

Methods: Ubuntu Linux 12.04 was chosen as the operating system for this project as it is free, stable, actively developed, widely deployed worldwide, and highly secure. DCM4CHEE, a free, open-source PACS software system, was chosen as it is actively developed and available on multiple platforms including Linux. Multiple commercial ‘cloud’ hosting options are available for deployment of Linux virtual machines. Amazon Web Services (AWS) was chosen for its low costs, wide use by the Linux development community, and flexibility in choosing the size and speed of the virtual machines used. The use of AWS permits virtual machine deployment in multiple regions worldwide with very little network latency regardless of the end-user location.

A pre-existing Ubuntu Linux 12.04 Amazon Machine Image (AMI) provided by AWS was customized to include a full installation of DCM4CHEE and its associated Audit Record Repository. The virtual machine only has a small amount of local storage available, so DCM4CHEE was configured to store recent studies locally, to compress image files using JPEG Lossless compression, and then copy all studies to Amazon’s Simple Storage Service (S3) which is an extremely low-cost, highly-redundant storage service (claimed 99.999999999% data durability).

Results: A stable virtual machine was produced, tested, and deployed for use successfully in multiple environments.

Discussion/Conclusion: Use of AWS for deployment of a secure, stable, low-cost, cloud-based PACS is feasible. Experience shows that deployment by high volume users may require a larger, more expensive AWS virtual machine instance, but for most uses, the smallest (‘micro’ or ‘t1’) AWS virtual machine is sufficient, and when using cost-control mechanisms in AWS such as their ‘reserved-instance’ option, costs for a fully functional PACS can be as low as $10 per month, with added Amazon S3 storage charges varying by the number of studies stored and the duration of study retention (US$0.03/GB/month). Costs associated with computer hardware purchase/leasing, power consumption, and offsite image backup are eliminated. Most PACS functionality, including study deletion, forwarding, and modification of some DICOM tags, can be controlled using a simple web-based interface to the PACS. More detailed machine configuration requires some expertise and use of both a separate web-based configuration screen and SSH access to the virtual machine.
FEASIBILITY OF A NOVEL GI IMAGING DEVICE FOR USE IN DOGS. B.T. Hardy\textsuperscript{1}, A. Sharma\textsuperscript{2}, J.A. Solomon\textsuperscript{1}. Infiniti Medical LLC, Menlo Park, CA, 94025\textsuperscript{1} College of Veterinary Medicine, University of Georgia, Athens, GA 30602\textsuperscript{2}.

Introduction/Purpose: The purpose of this study was to test the feasibility of a disposable and fully automated ingestible camera system to obtain images of the GI tract in ambulatory dogs. Cameras that image the visible light spectrum are frequently used in medical imaging. They are an essential component of endoscopes, which are used to visualize pathological processes involving a variety of anatomic spaces. Non-invasive imaging that has accurate pathological correlation can reduce patient morbidity and costs.

Methods: Five ambulatory light-based imaging devices were constructed and contained within a translucent 11x31mm capsule. The key components consisted of a battery, a light source, four auto-focusing cameras, a microprocessor, and an internal image storage system. An accelerometer was built into the microprocessor that synchronized camera activity with device motion. USB connectivity allowed for downloading of images to any PC.

Five client-owned dogs were food restricted for 24 hours prior to and 8 hours post capsule administration. Access to water was permitted throughout the study period. One capsule was administered to each dog using a direct pilling technique. The dogs were allowed to continue normal activity throughout the study.

The capsules were recovered and visually inspected for damage. Images were downloaded to a PC and reviewed. For each case, the total imaging time, total number of images, gastric transit time, and small bowel transit time were determined. Visualization of the mucosa and image quality were qualitatively assessed by a board certified veterinarian.

Results: Capsules were successfully administered to 5/5 dogs. All capsules were recovered within 36 hrs of administration (mean 24 hrs) and found to be intact. Capsules were active for 16 hrs (range 8-18 hrs) and were able to record up to 51,683 images. Mean gastric transit time was 79 min and small bowel transit time was 119 min. Visualization of the mucosa and image quality was described as excellent for the stomach, small bowel, and proximal colon. However, the remainder of the colon was poorly imaged due to retained feces significantly obscuring the mucosa and the cameras.

Discussion/Conclusion: Ambulatory light-based imaging performed with an ingestible camera system is feasible in dogs. It does not require restriction of activity or sedation and is capable of producing high quality images throughout the majority of the GI tract. The technology has the potential to be a low cost and simple way to perform GI imaging in dogs. This may greatly expand the role of imaging in dogs presenting with GI signs.
POSTER PRESENTATIONS

Introduction/Purpose: Surgeon autonomy in the operating room allows for faster surgical times and less surgical errors. Typically radiographs, CT, MRI or ultrasound studies are used as reference points during surgery and the navigation of these studies at our institution is carried out by non-sterile personnel in the operating room in response to verbal instructions. The goal of our study was to compare two methods for intraoperative image navigation, a sterile encased Nintendo Wii remote and a wireless computer mouse. The Wii remote was selected based on a previous study, which identified it as ergonomically superior to the mouse for image navigation in a standing position.

Methods: This study involved 7 participants (surgical and neurology faculty and residents). The device used for each procedure (Wii or mouse) was randomly selected by flipping a coin. After each procedure, the participants filled out a survey regarding the use of the particular device. Participants ranked statements in four categories (handling, accuracy and efficiency, connection and overall satisfaction) using a five point Likert scale. The results were compiled and 59 responses based on the navigation of CT and radiographs were analyzed using split-plot ANOVAs comparing the mean scores for each category.

Results: Handling: The mouse was significantly better for navigating radiographs than for CT (P=0.0044) and significantly better for navigating radiographs than the Wii (p=<0.0001). Accuracy and Efficiency: The mouse was significantly more accurate and efficient than the Wii remote (p=0.0001) and did not differ in accuracy and efficiency between modalities navigated (p=0.6841). Connection: Based on a binomial plot comparing connections, no difference was identified between the Wii remote and the wireless mouse (Odds ratio 1.161). Overall Satisfaction: The mouse was significantly more preferred than the Wii (p=<0.0001). A final survey after the conclusion of the study asked participants to rank the devices (Mouse, Wii remote and no device). A Friedman’s test on these rankings indicated that the mouse was significantly preferred to the Wii (p=0.0023) and to no device (p=0.0498)

Discussion/Conclusion: Overall, the mouse was preferred to the Wii remote in all categories. In comments collected through the final survey this was thought to be due to lack of familiarity with the Wii remote as well as software compatibility issues. Increased sensitivity with the Wii remote meant that many additional movements were required to select the correct image, window level or zoom. In this way the Wii remote was too frustrating a device for the participants. Based on these results, a sterile encased mouse may be beneficial to allow surgeon autonomy in image navigation in the operating room.
COMPARISON OF NASAL MUCOSAL CONTACT POINTS AND SEPTAL DEVIATIONS IN BRACHYCEPHALIC AND NORMOCEPHALIC DOGS USING COMPUTED TOMOGRAPHY. M. Auger, K. Alexander*, M. Dunn, G. Beauchamp. Département de sciences cliniques, Faculté de médecine vétérinaire, Université de Montréal, St-Hyacinthe, Québec, Canada. *DMV Veterinary Center, Lachine, Québec, Canada.

Introduction/Purpose: Dogs undergoing surgery for brachycephalic airway syndrome have variable improvement in clinical signs, possibly because all areas of airflow obstruction have not been corrected. Nasal mucosal contact points and septal deviations may contribute to airflow resistance. This study quantified nasal mucosal contact points and degree of septal deviation using computed tomography (CT) to determine if brachycephalic dogs differed from normocephalic dogs.

Methods: Dogs > 9 months of age, having undergone CT scan of the head (plica alaris to the choanae) and without nasal disease were included. Patients were divided into brachycephalic and normocephalic groups. Nasal contact points were identified using anatomic criteria and quantified. Septal deviations were identified and measured using angle of septal deviation. Total number of contact points, prevalence of contact points per anatomic location, prevalence of septal deviation and angle of septal deviation were calculated within each group and compared between groups using an exact χ² test or Student’s t-test for unequal variances.

Results: Eighteen brachycephalic (B) and 32 normocephalic (N) dogs were included. Prevalence of nasal contact points in the left (B 3.83 +/- 2.00; N 1.25 +/- 1.39; p<0.0001), right (B 3.94 +/- 2.62; N 1.50 +/- 1.50; p=0.0014), and both (B 7.78 +/- 4.21; N 2.75 +/- 2.66; p=0.0001) nasal cavities was significantly higher in brachycephalic dogs. No significant association was found between the number of contact points and recumbency, age, body condition score, body weight, and duration of anesthesia or sedation. The average number of contact points was significantly higher in females than in males (p=0.04). No significant difference was seen in prevalence (B 67%; N 66%; p=1) or in angle of septal deviation (B 15.5 +/- 8.9; N 10.5 +/- 4.3; p=0.09) between groups.

Discussion/Conclusion: As expected, nasal mucosal contact points were significantly more prevalent in brachycephalic dogs. Septal deviations were frequently present but affected both groups equally. Based on our findings, CT is an effective and non-invasive method of obtaining data on nasal contact points and septal deviations. Future prospective studies combining CT with functional airway testing would allow correlation of nasal contact points and septal deviation with airflow resistance, and provide additional evidence to support the use of laser-assisted turbinectomy and septoplasty in dogs with brachycephalic airway syndrome, in addition to standard corrective surgeries.
Introduction/Purpose: The stability of the spinal column is affected by many anatomical structures including bony protuberances, intervertebral discs, ligaments and paravertebral musculature. Thus, congenital malformation of one or more of these structures should affect the overall stability of the spine. This retrospective study was undertaken to assess the number and character of bony vertebral malformations specifically in Pug dogs, as a possible precursor to breed specific T3-L3 myelopathy.

Methods: All available radiographic and CT images of Pug dogs on the Michigan State University Veterinary Medical Center PACS from the dates of November 2008 through June 2013 (53 months) including either thoracic, lumbar, or thoracolumbar spine were reviewed for abnormalities. Electronic medical discharge instructions were reviewed for signalment and presenting clinical signs. This was a pilot study done to investigate the incidence of spinal anomalies before a prospective imaging and pathologic study on Pugs with T3-L3 myelopathies.

Results: 123 patients had imaging studies that met the criteria. 8/8 (100%) of CT studies had at least one vertebra with hypoplastic/aplastic caudal articular facets, while 74/115 (64.4%) of radiographic studies had at least one vertebra with this change. The most commonly affected vertebra was T12. Only 7 of these pugs were ataxic, as a possible indicator of myelopathy, 2 of which had other obvious causes of ataxia (spinal fractures, aortic thrombosis). Preliminary CT/MRI results, which are part of the prospective study on Pugs with T3-L3 myelopathy, will be discussed.

Discussion/Conclusion: Hypoplasia/aplasia of the caudal articular facets is very common in Pug dogs, and may be associated with instability of the thoracolumbar spine, but is often seen incidentally in asymptomatic Pugs. Further investigation into the occurrence of myelopathy in conjunction with this vertebral anomaly is ongoing, and warranted.
**Introduction/Purpose:** The radiographic anatomy of the equine distal tibia is complex, and has not been previously described in detail. Superimposition and radiographic similarity between the different osseous protuberances of the equine distal tibia can make it difficult for the practitioner to determine the location of a potential site of pathology. The purpose of this study is to provide an anatomical map of the equine distal tibia using standard radiographic projections of the tarsus. The study was inspired by a clinical case of a horse with multiple distal tibial chip fractures. The origin of the fracture fragments was difficult to ascertain using radiographic examination alone, and advanced tomographic imaging had to be performed for surgical planning.

**Methods:** A cadaveric, left equine pelvic limb was obtained from a hospital donation. The medical history of the horse is unknown; however, the tarsus was radiographically normal. The tarsal region was isolated from the distal tibial diaphysis to the mid-metatarsus to facilitate ease of manipulation, and stripped of all soft tissues. The tarsal and metatarsal bones were glued together in proper anatomical position, while the tibia was left freely movable. The osseous protuberances of the distal tibia, including all aspects of the intermediate ridge, and the cranial and caudal portions of the medial and lateral malleoli were individually outlined using metallic beads. The location of the long digital extensor tendon was also mapped to delineate the landmark between the cranial and caudal portions of the lateral malleolus. The distal portion of the tibia was then placed into proper anatomical alignment with the tarsus and held into place with positioning sponges. Standard radiographic projections for the tarsus (dorsoplantar, lateromedial, dorsolateral-plantaromedial oblique, dorsomedial-plantarolateral oblique) were made with each osseous protuberance separately delineated. These radiographs were used as a guide to create an anatomical map of the distal tibia on standard radiographic projections of a radiographically normal tarsus of a live, weight-bearing horse.

**Results:** The osseous protuberances of the distal tibia could be easily differentiated on standard radiographic projections of the cadaveric equine tarsus, and subsequently translated to tarsal radiographs of a live horse. The origins of distal tibial osseous fragments in a clinical equine patient were able to be located retrospectively using the anatomical maps.

**Discussion/Conclusion:** The anatomical maps for equine tarsal radiographs can provide a baseline of normal radiographic anatomy for teaching purposes, a reference for clinical interpretation of tarsal radiographs (particularly in the localization of distal tibial pathology), and to facilitate surgical and other interventional procedures.
EFFECT OF BOLUS SIZE ON DEGLUTITION AND ESOPHAGEAL TRANSIT IN HEALTHY DOGS.  D.M. Cheney, S.L. Marks, R.E. Pollard. School of Veterinary Medicine, University of California at Davis, California, 95616.

Introduction/Purpose: Contrast videofluoroscopy is the gold standard procedure for evaluating swallowing disorders, but quantitative measures can be altered in people by administering different bolus sizes and consistencies. We hypothesized that quantitative measurements of swallowing in dogs would differ between bolus sizes and consistencies.

Methods: Ten healthy purebred and mix-breed adult dogs underwent contrast videofluoroscopy in right lateral recumbency while swallowing 3 to 5 boluses of liquid (5mL, 10mL, and 15mL) and canned food (3g, 8g, and 12g). Studies were digitized and evaluated frame by frame to determine timing of swallowing events. Results were compared using a Students t-test. P < 0.05 was considered significant.

Results: Maximum pharyngeal contraction was delayed by 0.01s for large (0.11 ± 0.01) versus small (0.10 ± 0.01) solid boluses (p = 0.03). Epiglottic re-opening was delayed by 0.01s for large (0.25 ± 0.04) versus medium liquid boluses (0.24 ± 0.05) (p<0.01), and PES closure was delayed by 0.03s for large (0.29 ± 0.04) versus small liquid boluses (0.26 ± 0.05) (p=0.03). PCR was increased by 0.02 with small liquid boluses (0.13 ± 0.01) versus solid (0.11 ± 0.02) boluses (p < 0.01). Total esophageal transit time was delayed with solid boluses compared to similar sized liquid boluses for small (1.0s delay, p<0.001) and large (1.3s delay, p<0.001) sizes.

Discussion/Conclusion: Bolus size and consistency significantly impacted some but not all swallowing parameters measured by contrast videofluoroscopy. Further research is warranted to evaluate effects of bolus size in dysphagic dogs and dogs positioned in sternal recumbency.
RADIOGRAPHIC EVALUATION OF NORMAL TRACHEAL DEVIATION IN DOGS.  H. Cho, J.H. Choi. College of Veterinary Medicine, Chonnam National University, Gwangju, 500-757, South Korea.

Introduction/Purpose: Tracheal deviation can occur due to various lesions occupying space such as enlarged left atrium, heart base tumor, mediastinal mass, esophageal foreign body, megaesophagus and others. Thus, the presence and direction of tracheal deviation can be used as a clue for underlying pathologies. However, various degree of tracheal deviation can be encountered on lateral thoracic radiographs in normal dogs regardless of its head and neck position. The purpose of this study was to evaluate the prevalence, direction, location and degree of normal tracheal deviation and investigate the anatomical structure causing normal tracheal deviation on CT images.

Methods: In all studies, tracheal deviation was evaluated on lateral thoracic radiographs at cervical, thoracic inlet, intra-thoracic and hilar regions. The degree (mild; < 10% of trachea diameter, moderate; < 20%, marked; > 20%) and direction of tracheal deviation were estimated. In study I, tracheal deviation was assessed with head and neck in natural position, tilted back, flexed position in 5 healthy beagles. In study II, radiographs taken for various purposes were reviewed in 480 dogs including 25 large breed, 43 medium breed, and 382 small breed dogs. Among them, 126 dogs that have undergone both radiography and CT examination were investigated further whether underlying lesion caused tracheal deviation. Tracheal deviation due to pathologic lesions such as mediastinal, cardiac, or esophageal diseases and severe tracheal collapse were excluded from this study.

Results: In study I, intra-thoracic trachea was deviated dorsally at the 2nd rib level in only two dogs with head or neck in flexed position. Both dogs had mild tracheal deviation. In study II, tracheal deviation was found in 140 dogs (29.2%) and, in 19 of the 140 dogs, it was inconstantly found according to head and neck positions. The degree of tracheal deviation was mild in 91 dogs, moderate in 41 dogs and marked in 8 dogs. Trachea was deviated dorsally in 136 dogs; focally at the 2nd or 3rd rib level in 126 dogs, from thoracic inlet to the 2nd rib level in 3 dogs, and from the 2nd rib to the pre-hilar region in 7 dogs. Ventral deviation of thoracic trachea was seen in 3 dogs. One dog showed a crooked intra-thoracic trachea. Tracheal deviation was not seen at the cervical or hilar region. Contrast CT images of thorax were available in 6 dogs with tracheal deviation on radiography. Brachiocephalic, or common carotid artery displaced the trachea around the 2nd rib level in 4 dogs.

Discussion/Conclusion: Trachea was normally deviated in the dogs without space occupying lesions, particularly to dorsal direction around the 2nd rib region. Flexing of the dog’s head or neck could induce mild deviation of intra-thoracic trachea. The brachiocephalic and common carotid arteries could displace the thoracic trachea, although CT images should be investigated in larger number of dogs showing tracheal deviation. Normal tracheal deviation due to the dog’s position or anatomical structure should be considered to prevent misdiagnosis as tracheal deviation due to pathologic lesions in dogs.
CORRELATION OF MESENTERIC ECHOGENICITY ADJACENT TO ABDOMINAL LYMPH NODES AND CYTOLOGIC FINDINGS. A.C. Davé, L.J. Zekas, D. Auld. College of Veterinary Medicine, The Ohio State University, OH, 43220.

Introduction/Purpose: Abdominal ultrasound is a valuable diagnostic tool for the evaluation of abdominal lymph nodes in dogs and cats. Ultrasonographic criteria associated with malignancy have been described for both superficial and deep lymph nodes in these species. However, there is overlap of ultrasonographic characteristics of benign and malignant lymphadenopathy. The author’s clinical impression is that lymph nodes with focally hyperechoic adjacent mesentery are often neoplastic. This study retrospectively compared the mesenteric echogenicity adjacent to abdominal lymph nodes with cytologic results to assess if this characteristic would predict malignancy.

Methods: Records (2005-1013) were reviewed for small animal patients that had an abdominal ultrasound and ultrasound guided fine needle aspiration of at least one abdominal lymph node. Ultrasound images were retrospectively reviewed by a board certified radiologist and rotating intern and categorized by consensus into groups of lymph nodes with either hyperechoic or normal adjacent mesentery. Lymph nodes were further categorized based on cytological diagnosis as normal, reactive/hyperplastic, infectious/inflammatory, and neoplastic. Patients were excluded if the abdominal mesentery appeared diffusely hyperechoic or cytology was non-diagnostic. Proportions within each of the four diagnosis categories were compared for differences in proportions for a dichotomous outcome (normal or hyperechogenicity).

Results: 259 dogs and 117 cats were included. Of the canine cases, 107 had normal mesentery echogenicity (3 were cytologically normal, 54 reactive, 10 infectious, and 84 neoplastic) and 152 had hyperechoic mesentery (0 were cytologically normal, 4 reactive, 9 infectious, and 94 neoplastic). Of the feline cases, 77 had normal mesentery (5 were cytologically normal, 38 reactive, 10 infectious, and 24 neoplastic) and 40 had hyperechoic mesentery (3 were cytological normal, 5 reactive, 4 infectious, and 28 neoplastic). In both species, hyperechoic mesentery was statistically unlikely to occur adjacent to reactive lymph nodes (P < 0.002). No significant differences in LN-adjacent mesentery was apparent in other diagnostic groups.

Discussion/Conclusion: Reactive lymph nodes are unlikely to have focal hyperechoic adjacent mesentery. The presence or absence of hyperechoic adjacent mesentery is not statistically associated with malignancy. However, the majority of lymph nodes with hyperechoic mesentery were either infectious or neoplastic so fine needle aspiration of these nodes for cytologic diagnosis is recommended.
MAGNETIC RESONANCE IMAGING OF INTRAVENTRICULAR MASSES IN 4 CATS.  

Introduction/Purpose: Intraventricular masses are rare in cats. The purpose of this study is to describe the magnetic resonance imaging (MRI) characteristics of intraventricular masses in 4 cats.

Methods: Medical records of the Veterinary Hospital of the University of Pennsylvania were searched for cats diagnosed with an intraventricular mass detected on MRI between 2008 and 2014 which had a histopathologically confirmed diagnosis. All images were acquired using a 1.5T MRI unit and reviewed by a board-certified radiologist. Signalment, clinical signs, laboratory findings, MRI findings, and histopathologic diagnosis were recorded.

Results: A total of four cats were identified as having been diagnosed with an intraventricular mass on MRI. Histopathologic diagnosis revealed that three of the cats had ependymomas, while the last had a neuronal heterotopia. Neurologic localizations varied for the four cases with two having prosencephalic anatomic diagnoses and two being localized to the brainstem or having a multifocal localization (brainstem and either cervical or prosencephalic anatomic diagnoses). Laboratory findings in all four cats were largely unremarkable. The cats with ependymomas were 4 yr, 5 yr, and 9 yr old domestic mixed breeds. On MRI the ependymomas were hyperintense on T2W, T2W-FLAIR, and DW-EPI images; isointense on ADC images; isointense to hyperintense on T1W images; and had strong contrast enhancement. T2*W were available in two of the three cats; masses were T2*W isointense or hyperintense. While two of the ependymomas were small and homogenous, the largest mass was cavitated. All three cats had obstructive hydrocephalus, subtentorial occipital lobe herniation, and cerebellar herniation through the foramen magnum. Perilesional edema was noted in two cats, but questionable in the third. The cat with neuronal heterotopia was a 4 mo old domestic mixed breed and had very different imaging characteristics. The mass was homogenously isointense to grey matter on T2W, T2-FLAIR, T2*W, and T1W images. There was no appreciable contrast enhancement following the administration of gadolinium. The mass also was hyperintense on DW-EPI and isointense on ADC images. Obstructive hydrocephalus was noted; however there was no brain herniation or perilesional edema. The three cats with ependymomas were euthanized within 3 days of the MRI diagnosis. The cat with neuronal heterotopia had a ventriculoperitoneal shunt placed 5 months after MRI diagnosis and lived an additional 3 months until it decompensated and was euthanized.

Discussion/Conclusion: The magnetic resonance imaging characteristics of the three ependymomas were similar. As neuronal heterotopia is an improper arrangement of neuronal tissue and is congenital rather than a neoplastic process, it is understandable that the MRI characteristics varied greatly from those of the other three masses. This is the first reported case of neuronal heterotopia in a cat. Additional studies including larger case numbers as well as intraventricular masses of other etiologies are needed.
AUTORADIOGRAPHY - AN OLD TECHNIQUE COMES OF AGE. H. Dobson.
invICRO, Boston, MA, 02210.

Introduction/Purpose: Autoradiography is a technique that has been available for decades, largely resulting in two dimensional images of either a single slice of tissue or of a whole, but small, body. Classically, a radioisotope preparation, usually with a medium to longer half live is administered and images are collected using x-ray film. Advances in detector technology and image processing techniques have resulted in major improvements in the technology, allowing co-registration with other imaging modalities on both a macro and micro scale.

Methods: Using current quantitative whole body autoradiography technology specimens up to 45x15x10cm deep can be accommodated from macro imaging. Typically, specimens are frozen and 25 or 50 micron slices are made using a cryomacrotome. White light images of the slices are made immediately prior to collection of the radioisotope images. Images can be based on beta or gamma radiation or auger electrons. This allows for a wide range of radiopharmaceuticals, with specific tissue localization characteristics, to be used in vivo. Radioisotope standards are embedded in the processing block which allows for quantification of the distribution of radioactivity within the specimen. In addition to radioactive materials, fluorescent ligands can be used in vivo and quantified ex vivo in the specimens. The the autoradiography images can then be co-registered to in vivo imaging data such as MRI. Once the 3D data sets have been collected multiplanar reconstruction techniques can be used display combinations of the imaging modalities used in different planes.

Five micron slices are prepared for micro autoradiographic techniques. In addition to white light images these sections can be stained with standard histopathological stains and also with fluorescent stains. The use of fluorescent imaging techniques have been validated against immunohistochemistry and the former is both faster and more economic.

Results: To date studies have been performed using a wide range of species including dogs and non human primates. Clearly, the specimen size limitations precludes whole body imaging of dogs and non human primates, but parts of the body, such as the head and limbs can easily be imaged.

Discussion/Conclusion: The ability to co-register multiple different imaging modalities with white light images and the multiplanar reconstruction makes quantitative whole body radiography a versatile tool for both teaching and selected research studies. The quantification is particularly useful in the research setting.
ASSOCIATION BETWEEN REPORTED BEHAVIORAL PROBLEMS AND LUMBOSACRAL STENOSIS IN MILITARY WORKING DOGS. 1T.M. Dodd, 2J.C. Jones, 1I. Holásková. 1West Virginia University, WV 26506; 2Clemson University, SC 29634.

**Introduction/Purpose:** Lumbosacral stenosis (LSS) and behavioral problems are important causes of early retirement in military working dogs. We hypothesized that some behavioral problems may be associated with LSS in this population. Objectives of this retrospective cross-sectional study were to test associations between these two diagnoses in a sample of military working dogs and describe the most frequently reported behavioral problems in the subsample of dogs with significant associations.

**Methods:** Dogs were recruited from medical record and computed tomography (CT) archives at the Holland Military Working Dog hospital. Dogs were included if lumbosacral region CT scans had been acquired during the period of June 2013-July 2014 and if complete medical records were available. A pre-veterinary student (TD) who was unaware of CT diagnosis reviewed medical records and recorded behavioral problems reported before or at the time of CT scanning. Behavioral problems were assigned a score of 0 (absent) or 1 (present) for each of 10 possible categories. A board-certified veterinary radiologist (JJ) reviewed CT scans without knowledge of medical record findings and recorded a score of 0 (absent) or 1 (present) for LSS at each of four vertebral locations. Composite behavioral problem and LSS scores for each dog were also calculated by summing scores for all behavioral problem categories and vertebral locations. A statistician (IH) selected and performed tests of association using commercial software (JMP Version Pro11, SAS Institute, significance criterion alpha = 0.05).

**Results:** Fifty-five dogs met inclusion criteria. Of these, 21 dogs (38.2%) had recorded behavioral problems in at least one of the 10 categories and 44 (80.0%) had CT characteristics of LSS in at least one of the four vertebral locations. A positive correlation was identified between the composite number of behavior problems and composite number of vertebral locations with LSS stenosis (ρ = 0.37, p = 0.0062). Agreement was present between reported behavioral problems and LSS for dogs with none versus at least 3 vertebral locations of LS stenosis (scores 0, 3 and 4; p = 0.2059 for McNemar’s test of disagreement). A positive correlation (ρ = 0.43, p = 0.0173 for the nonparametric Spearman’s p test) was also identified in dogs having at least 3 locations with LSS. For the 12 dogs that had both multi-level LSS and reported behavioral problems, the most frequently reported behavioral problems were as follows: increased anxiety (25%), sudden onset of aggressive behaviors (25%), unwillingness or reluctance to jump up onto objects/into vehicles (33.3%), and unwillingness or reluctance to perform other working tasks (33.3%).

**Discussion/Conclusion:** Findings supported our hypothesis that some behavioral problems are associated with LSS in military working dogs, especially in dogs with at least 3 affected vertebral locations (multi-level LSS). To our knowledge, this is the first report describing an association between multi-level LSS and increased anxiety or a sudden onset of aggressive behaviors in military working dogs.

Introduction/Purpose: Several studies have been published concerning the differentiation of Inflammatory Bowel Disease (IBD) and Gastrointestinal Lymphoma (GL) in cats by measuring the thickness of gastrointestinal tract wall, or of the muscularis propria layer of the small intestine. The purpose of this study is to quantify the lymph nodes identified on ultrasonographic exams of cats with gastrointestinal lymphoma and inflammatory bowel disease and verify the possibility to distinguish these two diseases.

Methods: This retrospective study included 65 cats with lymphoma (53 lymphocitic and 12 lymphoblastic) and 17 cats with IBD, diagnosed by cytologic and/or histopathologic tests, from 2010 to 2013. The ultrasonographic reports were reviewed and the number of the described lymph nodes were tabled. Statistical analysis were performed (Mann-Whitney test).

Results: The number of lymph nodes detected on ultrasonographic exams vary from 0 to 7 per animal in IBD and from 0 to 8 in GL. The total number of each type of lymph node as well as the media and standard deviation (SD) of each one, per cat, are shown in the table below. In 5 (7,7%) cases of lymphoma and 2 (11,8%) of IBD none lymph node were identified.

<table>
<thead>
<tr>
<th></th>
<th>IBD</th>
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<th>GL</th>
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<tbody>
<tr>
<td></td>
<td>Total number</td>
<td>Media ± SD per cat</td>
<td>Total number</td>
<td>Media ± SD per cat</td>
</tr>
<tr>
<td>Jejunal</td>
<td>21 (45.7%)</td>
<td>1.2±0.8</td>
<td>105 (51.2%)</td>
<td>1.6±0.8</td>
</tr>
<tr>
<td>Colic</td>
<td>16 (34.8%)</td>
<td>0.9±0.9</td>
<td>58 (28.3%)</td>
<td>0.9±1.0</td>
</tr>
<tr>
<td>Gastric</td>
<td>2 (4.3%)</td>
<td>0.1±0.3</td>
<td>14 (6.8%)</td>
<td>0.2±0.6</td>
</tr>
<tr>
<td>Caudal mesenteric</td>
<td>3 (6.5%)</td>
<td>0.2±0.4</td>
<td>10 (4.9%)</td>
<td>0.2±0.5</td>
</tr>
<tr>
<td>Pancreaticoduodenal</td>
<td>4 (8.7%)</td>
<td>0.2±0.4</td>
<td>14 (6.8%)</td>
<td>0.2±0.4</td>
</tr>
<tr>
<td>Splenic</td>
<td>0 (0%)</td>
<td>0</td>
<td>4 (2.0%)</td>
<td>0.1±0.2</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>2.7±1.6</td>
<td>205</td>
<td>3.2±1.8</td>
</tr>
</tbody>
</table>

Discussion/Conclusion: Despite the greater number of lymph node saw per cat in GL, statistical analysis showed no difference between the two diseases. The percentage and media of which lymph node per disease was similar and cannot be a parameter to distinguish IBD from GL.
Introduction/Purpose: Microwave ablation (MWA) is performed in humans as a minimally invasive treatment of various cancers, and has been shown to reduce overall cost, morbidity and mortality compared to open surgical procedures. A single use MWA antenna is ~$3000 CAD, which considerably limits its use in veterinary patients. The objective of our study was to determine the structural and functional integrity of MWA antennas with repeated use and re-sterilization.

Methods: 17 saline cooled MWA antennas were divided into three groups of five antennas and one group of two controls. For each cycle (ablation, cleaning and sterilization), one, two and three ablations (140W for 6 minutes) were performed in bovine cadaver livers for each group respectively, except the controls. Antennas were cleaned and then sterilized in hydrogen peroxide plasma. Aerobic and anaerobic bacterial cultures were performed and the antennas assessed for damage with stereo light microscopy.

Results: Four reprocessing cycles were completed. No significant changes in the size of the ablation zones in the livers were noted (p=0.064). Progressive tearing of the silicone coating the antennas was observed over the cycles with a negative influence of the number of cycles on silicone tearing (p=1.12x10^9). No bacterial growth was present. Failure of two antennas occurred, prior to use at cycle 3 and during sterilization at the end of the 4th cycle, respectively.

Discussion/Conclusion: 13/15 MWA antennas remained functional for up to 4 reprocessing cycles when used at the maximum recommended settings. Further evaluation is required to determine the maximum number of cycles that MWA antennas can be re-sterilized. The clinical significance of the tearing of the silicone coating remains to be determined. This data will be necessary before the use of reprocessed antennas can be recommended in clinical patients.

**Introduction/Purpose:** Congenital malformations occurrence have been reported in all vertebrate classes and is generally incompatible with a prolonged life. A wide variety of these anomalies is described in reptiles, mainly in species that comprise Squamata order. In snakes, their incidence is related to low genetic variability of some populations, changes in environmental temperature and humidity, and environmental pollution. Characterizing the pathological process involved in these deformities is of fundamental importance to comprehend factors that interfere with reptile conservation. In this context, the purpose of this research was to characterize bone congenital malformations presented in 76 malformed snakes through radiographic and x-ray microtomographic techniques.

**Methods:** All individuals (n= 76 [50 B. jararaca and 26 C. durissus]) were subjected to digital radiographs in lateral and ventrodorsal positions, acquired using high-frequency equipment (Raytech and Tecno Designer, São Paulo, Brazil). Snakes presenting malformations as anophthalmia, bicephaly, rostral bifurcation, buphthalmia, cephalic malformation, cyclopia, hydrocephaly, kyphoscoliosis, lordosis and prognathism (n=9) were examined by x-ray microtomography (Skyscan 1176, Aartselaar, Belgium).

**Results:** The study revealed that B. jararaca specimens presented more severe axial lesions than C. durissus (Mann-Whitney test, p= 0.0187). In intraspecific analyzes, females of C. durissus species presented more severe axial lesions than males (Mann-Whitney, p=0.0028). Regarding the distribution of lesions, C. durissus specimens presented the spine final third as the most affected region by axial defects (Chi-Square, p=0.0007). X-ray microtomographic characterization of specific malformations allowed a detailed analysis and documentation of original congenital bone changes in snakes, as the agenesis of frontal, parietal and supraoccipital bones in a B. jararaca carrier of cephalic malformation.

**Discussion/Conclusion:** The use of radiographs and x-ray microtomography as an aid in the characterization of bone congenital malformations in snakes were effective, allowing further evaluation of bone changes related directly or indirectly to external defects characteristics. The quality of three-dimensional images and the possibility of interaction at 360 degrees yielded the identification of changes not previously related to these lesions, supplementing the information already described in literature. We believe these data provide a basis of useful information for future studies in the field of pathology, teratology, embryology and ecotoxicology in snakes.

Introduction/Purpose: The superorder Xenarthra, composed of sloths, anteaters, and armadillos, is a distinct clade of mammals with multiple anatomical and physiological differences in comparison to the domestic mammals. Anatomical descriptions of sloth vascularization are rare. The aim of this study was to describe the major thoracic and abdominal vasculature of the two-toed sloth, using CT-angiography.

Methods: For this retrospective case series, we gathered CT angiographic studies including both thorax and abdomen of sloths. For that, the radiology information system of the University of Florida College of Veterinary Medicine was searched for all CT reports containing the word 'sloth' from January 2009 to April 2015. Three CT studies that met these criteria were retrieved.

Results: Among the studies retrieved, the clinical reasons for the CT study included gastrointestinal signs, such as bloating and diarrhea, or non-specific signs, such as lethargy and weight loss. The major arterial branches of the thoracic and abdominal aorta, and the tributaries of the hepatic portal vein were similar to domestic mammals. Due to the caudal location of the kidneys, next to the ilia, the renal arteries were longer. The major differences in the thoracic and abdominal vasculature resided in the systemic venous system. In all cases, there was a large, right-sided, epidural vertebral vein, occupying 30-50% of the vertebral canal along its length. This vein receives blood from the pelvic limbs and inguinal region through the iliac veins. This epidural vertebral vein delivers this blood to the cranial venal cava, just adjacent to the right atrium, via three right interfominal veins located from T8-9 to T10-11. These interfominal veins formed a single large vein, which inserted into the cranial venal cava (CVC) perpendicullary, resembling the insertion of the azygous vein in domestic mammals. Also in all cases, the pre-hepatic caudal vena cava was duplicated, draining the renal veins. In two of the three cases, the duplicated CVC ran dorsally, reaching the epidural vertebral vein from T18-19 to T20-21 intervertebral foramina. In one case, the double CVC formed a single vessel cranially, at the level of the spleen. This single pre-hepatic CVC coursed between the liver lobes to reach the post-hepatic CVC, at the level of the diaphgram. A post-hepatic caudal vena cava was present in all cases.

Discussion/Conclusion: This large epidural vein is not seen in domestic mammals, and caudal vena cava duplication is an uncommon variant in domestic mammals; however, these represent normal arrangement of the venous system in the superorder Xenarthra, or the orders Cetacea and Phocidae. Awareness of this vascular pattern in the sloth may avoid diagnostic pitfalls and intra-operative complications.
**FDG UPTAKE OF CANINE BENIGN AND MALIGNANT TUMORS ON PET/CT IMAGING.**  S.H. Hong¹, S.Y. Kwon², S.J. Park¹, J.J. Min², J.H. Choi¹. ¹College of Veterinary Medicine, Chonnam National University, Gwangju 500-757. ²Department of Nuclear Medicine, Chonnam National University Hwasun Hospital, Jeonnam 519-763, South Korea.

**Introduction/Purpose:** The uptake of ¹⁸F-fluorodeoxyglucose (FDG) reflects the glucose metabolic activity of the lesion on positron emission tomography/computed tomography (PET/CT). Standard uptake value (SUV), is a semi-quantitative endpoint for FDG, and a maximum SUV (SUV_max) of 3 is defined as the threshold value for human bone or soft tissue tumors and high SUV_max is reported to be associated with shorter survival in patients with malignancy. This study investigated SUV_max of dogs with malignant or benign tumors and compared them with previous canine reports to provide the basic information of SUV_max in canine cancer patients.

**Methods:** PET/CT was performed approximately 60 min after intravenous injection of 11 MBq/kg of FDG in 17 dogs including 6 lymphomas, 2 mast cell tumors, 2 adenocarcinomas, and 2 tubulopapillary carcinomas and each squamous cell carcinoma, osteosarcoma, hemangiosarcoma, thymoma and hepatocellular adenoma. SUV_max were measured from primary lesion in all dogs.

**Results:** Mean value of SUV_max was 4.1 in lymphomas (range, 1.7–9.0), 5.2 in mast cell tumors (range, 4.6–5.8), 5.1 in adenocarcinomas (range, 3.8–6.4), 3.0 in tubulopapillary carcinomas (range, 2.4–5.2), 12.7 in squamous cell carcinoma (range, 12.3–13.1), 6.5 in osteosarcoma (range, 6.2–6.8), 6.2 in hemangiosarcoma, 2.2 in thymoma and 1.1 in hepatocellular adenoma. Mean values of SUV_max were 4.9 for malignancy and 1.65 for benign tumors although there was some overlap between two groups.

**Discussion/Conclusion:** The SUV_max for malignant lesions was higher than that of benign lesions. When the range of SUV_max in the present study was compared with that of the previous canine studies, the SUV_max tended to be higher for lymphoma (2.8–5.4) and mast cell tumor (3.4–4.11), lower for adenocarcinoma (6.86–27), and similar for squamous cell carcinoma (12.8–17.1), although the SUV_max was reported in a few canine cases. This study presents the reference value of SUV_max for malignant and benign tumors in dogs. FDG uptake may be underestimated in small sized lesions, however SUV can provide useful information to determine the characteristics of tumors.
Introduction/Purpose: Transthoracic echocardiography (TTE) is the primary modality for evaluating cardiac dimensions and function in dogs. In the English bulldog, TTE is challenging due to the breed’s unique thoracic conformation with dorsoventral compression and narrow intercostal spaces. Multi-detector computed tomography angiography (MD-CTA) circumvents body conformational challenges and is a gold standard for cardiac dimensions in humans.

Methods: Eleven English bulldogs with normal hearts by physical examination and TTE were studied. Dogs underwent both TTE (Vivid 7; GE Medical Systems) and sedated MD-CTA (SOMATOM Definition Flash; Siemens Healthcare) within 24hrs of the other. Standard cardiac dimensions were compared between modalities, measured twice by the same observer and separately by two other observers. Comparisons of TTE to MD-CTA dimensions were performed by Wilcoxon signed-rank test; intra- and interobserver variability was assessed by coefficient of variation (CV).

Results: Nine of the 25 measurements of linear cardiac dimensions were significantly different between TTE and MD-CTA (all P < 0.032). Overall intraobserver agreement was strong with average CVs of 5.34% for TTE and 2.50% for MD-CTA. Overall interobserver agreement CVs averaged 6.5% for TTE and 8.75% MD-CTA.

Discussion/Conclusion: Differences were found between cardiac dimensions as measured by TTE and MD-CTA, indicating the two methodologies are not equivalent. Sedated MD-CTA yielded high-quality imaging with strong intra- and interobserver measurement repeatability in English bulldogs, providing cross-sectional reconstructions of cardiac morphology in a breed challenging to image by TTE.
IMAGING FINDINGS IN HORSES WITH LYMPHOMA: A RETROSPECTIVE STUDY OF THIRTEEN CASES. V. Janvier, L. Evrard, S. Cerri, A. Gougnard, V. Busoni. University of Liège - Faculty of Veterinary Medicine – 4000 Liège, Belgium.

Introduction/Purpose: Imaging is an essential part of the clinical work-up in horses with lymphoma. Case studies focused on the description of imaging findings and in particular on the ultrasonographic (US) assessment of lymph nodes in equine lymphoma are scarce. This retrospective study describes imaging findings at abdominal and thoracic ultrasound and on thoracic radiographs in 13 horses with a confirmed diagnosis of lymphoma. It also provides description of the landmarks that can be used to localize caudal deep cervical lymph nodes.

Methods: Medical records of horses referred between December 2006 and September 2014 at the University of Liège, Belgium, were reviewed to select cases with a final diagnosis of lymphoma based on fine needle aspiration, core needle biopsy or necropsy. Cases included had undergone a complete US examination of the abdomen with or without additional radiographic and/or US examination of the thorax. Two radiologists (second and last author), aware of the final diagnosis of lymphoma, reviewed retrospectively the imaging reports.

Results: Lymphadenopathy (8 horses), peritoneal effusion (6 horses), splenic (6 horses) and hepatic (5 horses) changes were the most common imaging findings. Splenic and hepatic US abnormalities included mainly hypoechoic nodules, organomegaly and diffuse echogenicity changes. Digestive tract involvement was detected in 3 horses that showed focal areas of thickened and hypoechoic small (2 horses) and large intestinal (2 horses) wall. Abnormal thoracic findings were pleural effusion (4 horses), lymphadenopathy (4 horses) and lung parenchymal changes (3 horses). Abnormal lymph nodes were detected radiographically (4 horses) and/or ultrasonographically (2 horses) in the thorax and ultrasonographically in the abdomen (7 horses) and in the caudal cervical region (4 horses). Based on clinical, imaging and necropsy findings lymphoma was considered multicentric in 8 horses, alimentary in 2, splenic in 2 and mediastinal in 1 horse.

Discussion/Conclusion: This retrospective case series describes in detail common abnormal imaging findings of equine lymphoma and point towards the fact that ultrasonography can be routinely used to assess intraabdominal, thoracic and cervical lymph nodes in horses. In the present report, abnormal lymph nodes were mainly hypoechoic and round instead of oval. In only one case the echogenicity was heterogeneous. Four horses presented concomitant involvement of the spleen and the liver. Only one horse presented cecal lymphadenopathy and was diagnosed with a multicentric lymphoma. Necropsy demonstrated involvement of lymph nodes at the thoracic inlet in 4 other horses that had not undergone cervical ultrasound and without thoracic involvement. This finding supports the use of US examination of the caudal cervical region in order to assess superficial and deep cervical lymph nodes in the routine work-up of horses with suspected lymphoma, with or without suspected thoracic involvement.

Introduction/Purpose: Cobalamin and folate levels are typically measured in dogs and cats with gastrointestinal (GI) signs and are used as indicators of GI tract dysfunction. Abdominal ultrasounds are typically performed in this same population. No previous studies have looked at whether GI tract characteristics, such as individual wall layering and general overall wall thickness are different in dogs and cats with GI disease with measured cobalamin and folate levels vs. healthy dog and cat established sonographic GI wall and individual layer measurements1.

Methods: A retrospective study was performed with thirty one dogs and fifteen cats with clinical GI disease. Inclusion criteria were a Texas GI panel and abdominal ultrasound performed within one week of each other. All animals presented to the Colorado State University Veterinary Teaching Hospital within the last two years. Still ultrasound images of the GI tract were used to measure overall wall and individual layer thickness. The images were evaluated by a board certified radiologist to look for differences in echogenicity of each layer. The results were analyzed looking for statistically significant differences.

Results: Cats with low folate had an overall thicker duodenal wall (mean 2.52mm, SD 0.8mm), as well as thicker muscularis (mean 0.46mm, SD 0.31mm) and mucosal (mean 1.14mm, SD 0.36mm) layers of the duodenum than healthy cats (overall thickness mean 2.2mm, SD 0.17mm overall). Also cats with low normal cobalamin had thicker duodenums (mean 3.35mm, SD 0.35mm), as well as all individual layers. Cats in all folate categories (low, normal, and high) had thicker small intestinal overall wall (mean 2.28-2.49mm), as well as thicker serosa, muscularis, and submucosal layers than healthy cats (mean 2.22mm). Cats with low cobalamin (mean 2.51mm, SD 0.68mm) or low normal cobalamin (mean 3.00mm, SD 0.0mm) had thicker small intestines overall when compared to healthy cats. The serosa, muscularis and submucosa were also thicker in all cobalamin categories (low, low normal, and normal) versus healthy cats. Hyperechoic mucosal flecks were observed in 30% of dogs and cats with high normal to high folate and low normal to low cobalamin and in 25% of dogs and cats with low folate and low normal to low cobalamin. There were species differences with cobalamin and folate levels. Eight dogs and zero cats had a high cobalamin level (p=0.0218) and thirteen dogs and zero cats had high normal folate (p=0.0002). There were no statistically significant findings in dog GI wall thickness and layering in this study.

Discussion/Conclusion: These findings suggest that cats with GI disease and measured cobalamin and folate levels have increased thickness of their duodenum and small intestines (including individual layers). There is evidence that there may be a species difference in cobalamin levels between dogs and cats but further studies are needed. Hyperechoic mucosal flecks were found in a high proportion of dogs and cats with abnormal cobalamin and folate levels and clinical GI disease.

PULMONARY ATELECTASIS: COMPUTED TOMOGRAPHY FINDINGS IN HEALTHY BEAGLES UNDER GENERAL ANAESTHESIA. Le Roux C¹, Cassel N¹, Kirberger RM¹, Fosgate G², Zwingenberger AL³. ¹Department of Companion Animal Clinical Studies and ²Department of Production Animal Clinical Studies, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa and ³School of Veterinary Medicine, Department of Surgical and Radiological Sciences, University of California, Davis, California.

Introduction/Purpose: A large proportion of dogs undergoing computed tomography (CT) are anaesthetised and receive concurrent supplementary oxygen. Both factors are known to be major contributors to the development of pulmonary atelectasis. Pulmonary atelectasis may mask or mimic lesions in the lung. The aim of the study was firstly to determine whether significant atelectasis would develop using a standardised commonly employed spontaneously-breathing anaesthetic protocol in a typical hospital setting, especially in cases where patients may already be anaesthetised in lateral recumbency prior to CT scanning. Secondly, to determine whether a change in body position to sternal recumbency would be sufficient to resolve any atelectasis and the length of time required for resolution.

Methods: Six healthy adult female Beagles were anaesthetized in sternal recumbency immediately prior to commencement of CT scanning. Using a breath-hold technique without hyperventilation, helical 3-mm thick transverse thoracic images were acquired. A baseline scan was performed in sternal recumbency, followed by placement of the dogs in either right (RLR) or left lateral recumbency (LLR) for 30 minutes, with scans performed at predetermined lung lobe locations and time intervals. The dogs were then repositioned in sternal recumbency for a further 20 minutes, with similar scans performed. The study was then repeated two weeks later with dogs in the opposite lateral recumbency. Changes in Hounsfield units and cross-sectional area of the five lung lobes were measured using free-hand regions of interest. Signs of cranial diaphragmatic excursion and mediastinal shift, such as tracheal and cardiac displacement, were also assessed.

Results: Lateral recumbency did not result in true atelectasis or evidence of mediastinal shift and diaphragmatic excursion in a medium-sized breed dog of normal body condition. Infrequently, patchy increased attenuation could be visualised in the left lobes during LLR. These attenuation changes failed to resolve completely during sternal recumbency. The left cranial pars caudalis lobe was affected most frequently. However, the left pars cranialis was affected the earliest, often within 3 minutes in LLR. The pars cranialis and caudalis were affected to the same extent.

Discussion/Conclusion: The degree of atelectasis formation in the clinical setting appears to be overestimated, and the study did not support the hypothesis that lateral recumbency would induce true pulmonary atelectasis. Anaesthesia in lateral recumbency should not preclude CT scanning.
Introduction/Purpose: Magnetic resonance diffusion imaging is highly studied in human neuroimaging due to the added value in differentiating intracranial diseases and predicting both prognosis and disease recurrence. Minimal information is available in veterinary medicine for normal values; available reports do not include both apparent diffusion coefficients (ADC) and fractional anisotropy (FA) measurements or separate values for grey and white matter. The purpose of this study is to determine the normal ADC and FA values at 3T in multiple locations of the brain, including separate measures for grey and white matter.

Methods: ADC and FA values were calculated in dogs with clinically normal neurologic exams and no history of intracranial disease/signs. Three circular regions of interest for each region by two separate observers were performed, including separate grey and white matter measurements. Measurements were obtained in the individual cerebral lobes (frontal, parietal, occipital, temporal), cerebellum, thalamus, pons, medulla, and hippocampus. Left and right measurements were obtained where possible.

Results: A total of 13 dogs met the inclusion criteria. No significant differences were identified between left and right lobes, ADC white matter values by lobe, or ADC values by reader (excluding right and left thalamic regions). Significant variation was noted for FA values between readers and by lobe and for grey matter ADC values between lobes. A positive correlation was identified between ADC and patient age for multiple regions, but not with FA values and age. When comparing measurements for grey and white matter, ADC was significantly lower and the FA was significantly higher for white matter.

Discussion/Conclusion: The differences in tissue structure of grey and white matter explain the significant value differences for both ADC and FA. As white matter is predominantly composed of axons, the diffusion pattern is highly directional, along the axonal pathways, resulting in lower ADC and higher FA values when compared to grey matter, which is predominantly composed of cell bodies. The interlobar value differences identified for FA (grey and white matter) and ADC (grey matter) indicate that global values may not be meaningful when comparing normal to abnormal, and specific normal values are required for each lobe. The increasing ADC values noted in multiple areas of the brain with age are presumably due to alterations in tissue structure and composition. However, the source of the change is not fully understood at this time and is an area for further research. The variability between the two readers for FA values may be related to reader experience, as these represent the first 13 patients where such measurements have been obtained. However, while there is some inter-observer variation, all white matter FA values were within previously reported white matter ranges. Although this is just the beginning of diffusion imaging in veterinary medicine, understanding normal is the first step to determining the utility of diffusion imaging for characterization of abnormal.
**Introduction/Purpose:** Tracheal and pharyngeal collapse is a dynamic or static condition with decreased tracheal or pharyngeal diameter. Pharyngeal collapse refers to complete or partial collapse of the pharynx with dorsal displacement of the soft palate or ventral deviation of the dorsal pharyngeal wall. Both tracheal and pharyngeal collapses are generally diagnosed by fluoroscopy or radiography; however, the degree of the airway collapse in healthy dog has not been determined. The purpose of this study was to evaluate the diameter changes of trachea and pharynx in healthy dogs and dogs with tracheal collapse with radiography and fluoroscopy.

**Methods:** Nineteen clinically healthy dogs (group 1) and thirty-one dogs suspected of tracheal collapse (group 2) were enrolled. Tracheal diameter was evaluated in inspiration and expiration phase on radiography and also before and after inducing coughing on fluoroscopy. Tracheal collapse was graded as 0%, 25%, 50%, 75% or 100% of tracheal diameter at the cervical, thoracic inlet, thoracic and hilar region. Pharyngeal diameter was evaluated before and after inducing coughing on fluoroscopy. Pharyngeal collapse was defined as wide dorsal to ventral excursions of the pharyngeal soft tissue with narrowing of the nasopharyngeal or laryngopharyngeal luminal diameter and determined as complete collapse if complete loss of lumen was seen, and partial collapse if lumen diameter objectively decreased by >50% further.

**Results:** Cough could not be induced in 26% (n=5) of group 1 and 10% (n=3) of group 2. In group 1, cervical and thoracic fluoroscopic images with respiration and coughing were available for 19 and 14 dogs, respectively. One (5%) dog showed tracheal collapse (<20%) at hilar region on radiography and four (21%) dogs showed tracheal collapse (range, 10–17%) at hilar region only after inducing coughing on fluoroscopy. Three dogs with pharyngeal collapse were identified on fluoroscopy before or after inducing coughing and the median value of the collapse was 25% with a range of 10–100%. In group 2, tracheal or pharyngeal collapse was found in 78% (n=27) and 7% (n=2) of 27 dogs on lateral thoracic radiographs, and 87% (n=27) and 35% (n=11) of 31 dogs on fluoroscopy, respectively. The mean value of the pharyngeal collapse was 43% (range, 11–93%) or 61% (range, 12–100%) on fluoroscopy before and after inducing coughing, respectively.

**Discussion/Conclusion:** The change in airway diameter during respiration was not seen in most of healthy dogs. Four dogs showing approximately 16% collapse of tracheal diameter at hilar region on radiography or fluoroscopy after inducing coughing. Complete pharyngeal collapse was found in one healthy dog after inducing coughing. In symptomatic dogs, the degree of tracheal collapse after inducing coughing was >25% at the hilar region. The incidence and severity of pharyngeal collapse was underestimated on radiography, and fluoroscopy is essential diagnostic tool for pharyngeal collapse.
NORMAL ASPECTS OF THE EYE ULTRASOUND IN IGUANAS (IGUANA IGUANA).
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Introduction/Purpose: Green iguana (Iguana iguana) is used as a pet and ocular lesions are commonly reported. The purpose of this study was provide normal values of ophthalmic echobiometry and report our findings about evaluation of the conus papilaris in iguanas.

Methods: All protocols were in accordance with the Biodiversity Authorization and Information System of the Brazilian Ministry of the Environment (no. 27489-1) and ARVO. Eleven healthy green iguanas from the Wild Animal Screening Center (IBAMA) were evaluated with only manually restrained. Its length and weight were checked. Proxymetacone 0.5% was instilled in each eye before ultrasound procedures. B-mode and Doppler ultrasound (Nemio, Toshiba® machine; 9-12MHz probe) were performed on each eye on dorsal plane. The anterior chamber depth (ACD), lens length (LL), posterior chamber depth (PCD) and total eye length (TEL) were measured in the central part of the eyeball. The conus papilaris (Cp) tissue was measured in its length and width at 4.5 and 7.5 hours (clock analogy). For statistic analysis a confidence interval of 95% was used.

Results: From anterior to posterior view we could see: the cornea (thin, convex, hiperechoic line), an anechoic AC, the wall lens (thin convex and concave hiperechoic thin line), and the anecoic PC where we can find the Cp. The Cp had always the same aspect: a thin, triangular and homogeneous echogenic tissue, with its base at the fundus of the eye and the apex at the posterior wall’s lens. Doppler evaluation shows in 3 iguanas a little vascular sign uptake on the Cp tissue. In 8 iguanas a vascular sign was seen outside eyeball, at the same direction of insertion of the Cp. As a parametric data (Shapiro-Wilk normality test), the paired t-test verified no difference between right and left eyes (RE;LE). Thus, to the Pearson correlation test between measurements and weight and length were used 22 samples (11 RE plus 11 LE). In the dorsal plane, the ACD vary from 1.0 to 1.6mm (mean±standard deviation to the RE=1.3±0.19mm and to the LE=1.21±0.2mm); the PCD vary from 6.1 to 7.9mm (RE=6.9±0.54;LE=6.94±0.6mm) the LL vary from 3.9 to 5.3mm (RE=4.46±0.36;LE=4.47±0.36mm); the TEL vary from 11.2 to 14.1mm (RE: 12.7±0.96;LE: 12.64±0.91mm). No correlation was found with iguana’s length. There was correlation between animal’s weight and the the size of ACD (r=0.55; p=0.016), lens (r=0.55; p=0.0072), PCD (r=0.70;p=0.034); TEL (0.73; p=0.0001).

Discussion/Conclusion: Measurements of the ACD, lens, PCD, TEL tend to be higher as heavier the iguana is. Some animals moved their eyes hindering the position of the transducer and took longer time. Results could be used as standard data to comparison to an abnormal condition. The easier Cp vessel was identified in a more stressed pregnant animal. More studies are necessary to correlate the vascular aspect of the Cp and the degree of stress.
INTERACTIVE MULTIDETECTOR COMPUTED TOMOGRAPHIC (MDCT) ATLAS OF THE ENDANGERED KEMP’S RIDLEY (LEPIDOCHELYS KEMPII) SEA TURTLE.

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Introduction/Purpose: Wildlife care-providers and veterinarians often perform modern diagnostic imaging studies of species for which detailed anatomic resources may not be readily available. Recently, rehabilitation centers along the Gulf of Mexico are reporting increased numbers of sea turtle strandings (especially the Kemp’s ridley species). Deleterious human interactions, natural and industrial disasters and changes in natural habitat are culpable. CT is a fast, high-yield and noninvasive modality commonly used to evaluate the species. CT mitigates anatomic noise from the superimposed bony shell, and allows for more succinct localization of lesions, especially within the coelomic cavity, compared to standard radiographs. The widespread use of CT is hampered by lack of timely access to a comprehensive tomographic anatomic resource for the species and need for specialty knowledge of tomographic imaging physics and artifacts. We propose that universal access to a detailed, comprehensive, virtual and interactive CT atlas will improve the clinical potential of the modality.

Methods: Retrospective and non-enhanced (n=23); and prospective and enhanced (n=1), MDCT studies of Kemp’s ridley sea turtles undergoing rehabilitation for a variety of reasons, performed between 2010 to 2014, were evaluated. Turtles underwent CT as part of clinical intake or release health assessment. Studies and protocols were evaluated for diagnostic quality. CT images (maximum intensity projections, transverse, 2D multiplanar and 3D volume-rendered reconstructions) were evaluated, manipulated, post-processed, and labeled with the assistance of traditional, species-specific dissection guides, peer-reviewed literature, and review of the rehabilitation/medical record. Custom programming allowed for image integration into an interactive eBook.

Results: Images of normal turtles (n=14) were used to create a comprehensive CT atlas. Turtles with abnormalities (n=9) were included in the resource for comparison. Protocols and corresponding image quality are described. Specific recommendations for improved protocols are made. Clear indications for the use of a nonionic iodinated agent are not established in this species. We propose a priori method of intravenous administration and dose (n=1). A novel, user friendly, detailed, widely accessible, species specific, free eBook, Kemp’s ridley CT atlas was created.

Discussion/Conclusion: Advanced imaging is increasingly used to evaluate sea turtles due to its superior diagnostic capabilities when compared to standard radiographs. We propose to make this process more accessible by producing a novel platform for displaying an anatomic CT atlas for the endangered Kemp’s ridley sea turtle. The comprehensive, interactive, and updatable tomographic resource will fill current voids in the literature and will serve as a valuable diagnostic tool for clinical management, health assessment and education.
Introduction/Purpose: The objective of this retrospective study was to determine if midline shift on brain magnetic resonance imaging (MRI) was related to prognosis in dogs with meningoencephalitis of unknown etiology (MUE).

Methods: Medical records were reviewed from 2 institutions – UW Veterinary Care (2007 – 2013) and VCA Aurora (2005 – 2008). Inclusion criteria included: clinical signs referable to intracranial disease, brain MRI performed at presentation, abnormal cerebrospinal fluid (CSF) analysis, and negative infectious disease testing. MRIs were evaluated for midline shift using the T2-weighted transverse image closest to the interthalamic adhesion. Statistical analysis was performed to assess relation between survival and midline shift and other variables including age, body weight, TNCC, and CSF protein (p < 0.05 was considered significant).

Results: 52 dogs met the inclusion criteria. The overall estimated median survival for all dogs was 483 days. Estimated median survival for dogs in with no midline shift was 1717 days and with midline shift was 84 days. Survival was not significantly different between the two groups (p=0.09). Using multivariate analysis, age at the time of diagnosis (p=0.03) and CSF total nucleated cell count (p=0.03) were significantly associated with survival.

Discussion/Conclusion: Evaluation of midline shift in the region of highest lesion burden or in a larger cohort of dogs, may be of prognostic value. The results of this study indicate that midline shift should not be used in clinical practice as a prognostic indicator for dogs with MUE, however other factors evaluated in this study may aid with prognostication.
DEVELOPMENT OF A MAGNETIC RESONANCE IMAGING PROTOCOL FOR BONE DETAIL OF THE CANINE CARPUS. S.L. Pownder¹, K. Hayashi², P. Shah¹, H.G. Potter¹, M.F. Koff¹. 1. Hospital for Special Surgery, NY 10021, 2. Cornell University, NY 14853.

Introduction/Purpose: The use of computed tomography (CT) to assess bone after standard of care (SOC) magnetic resonance imaging (MRI) may be a redundant diagnostic imaging combination. The mantra that “MRI is for soft tissue and CT is for bone” is commonly touted. Often, both modalities are used in combination to evaluate the same problem. This may lead to an untenable financial burden to the owner and prolonged patient anesthesia. The purpose of this study was to develop a canine carpus MRI protocol with comparable spatial resolution as CT, using commercially available software and coils, within a clinically-feasible scan time.

Methods: Canine carpi were obtained from cadavers of an IACUC-approved study unrelated to this project. MRI was performed on a 3T unit (GE Healthcare, Waukesha, WI) with an 8 channel phased array wrist coil (Invivo, Gainesville, FL). A 3-D spoiled gradient recalled-echo (SPGR) technique was performed using parameters commonly cited¹ (Fig 1A). Additional SPGR sequences were performed varying receiver bandwidth (41.7 – 62.5 khz), frequency encoding (256-512), phase encoding (256-384), slice thickness (0.5-1mm), and number of acquisitions (NEX/NAQ1-3).

Results: The SOC protocol produced low resolution images (Fig 1A, time 3 min). The highest resolution image was produced in just over twice the scan time as the SOC (Fig 1B, 7min). Increasing spatial resolution and signal improved conspicuity of normal structures, and removed chemical shift artifact at the articular margins. The spatial resolution (0.5 x 0.2 x 0.3 mm) exceeded that commonly acquired for CT. Additional acquisitions with mid-range spatial resolution produced diagnostic images in 4-6 min.

Discussion/Conclusion: The improved spatial resolution afforded by the increased scan time provides superior image quality when performing canine carpal MRI. The protocols performed in this study require careful selection of parameters based on individual MR software and hardware and will be discussed further. Such a protocol may obviate the need to send patients from MRI to CT in order to acquire a dataset for bone assessment. References 1: Ober CP, Freeman LE. Computed tomographic, magnetic resonance imaging, and cross-sectional anatomic features of the manus in cadavers of dogs without forelimb disease. Am J Vet Res. 2009 Dec;70(12):1450-8.

Introduction/Purpose: Elastography is a promising ultrasound technique that evaluates tissue elasticity by compression, acoustic radiation force impulse (ARFI) and real-time shear velocity (RSV)\(^1\). In veterinary medicine, the ARFI technique is recent and experimentally has been used to evaluate focal liver lesions\(^2\), mammary tumours in female dogs\(^3\), and the spleen, liver and kidneys of adults dogs\(^4\), splenic tissue in felines\(^1\) and prostate and testicles in canines\(^5\).

To evaluate the stiffness of healthy renal parenchyma, and determine the quality and quantity of shear wave velocity using ARFI technique in adult cats’ kidneys.

Methods: Ten healthy adult short hairs felines were selected by B mode ultrasonography; ARFI elastography was used to determine shear wave velocities at several sites of cortex and medullar (cranial, middle and caudal).

Results: B-mode sonography showed normal findings in all cats. Qualitative and quantitative elastography of the cranial, middle and caudal sites of the kidneys were easily performed in all patients. Qualitative elastography showed that renal cortex was not deformable and with homogeneous dark gray areas; renal pelvis with lower stiffness (white); and the medullar showed a mixed pattern (mosaic). The results of shear wave velocity were different in cranial, middle and caudal regions of cortex and medulla: 2.46 ± 0.45, 2.46 ± 0.48 and 2.37 ± 0.42 (P = 0.795) in cortex and 1.61 ± 0.69, 1.75 ± 0.66 and 2.00 ± 0.55 m/s (P = 0.156) in medulla.

Discussion/Conclusion: Quantitative and qualitative ARFI elastography of the kidney in adult cats was easily implemented and may provide base line data in the study of this organ to allow the use of ARFI.

References
ACVR 2015 Conference Special Activities

Thursday, October 8, 2015
Lunch and Learn:
“Non-academic Residencies; Saving Our Specialty?”
Sponsored by Antech Imaging Services
Everyone Welcome
11:45 am – 1:15 pm
Ballroom 1-2

Thursday, October 8, 2015
ACVR Welcome Reception
Reception supported by:
Antech Imaging Services
Universal Medical Systems, Inc.
6:30 – 8:30 pm
Windows and Terrace – 6th Floor

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

Friday, October 9, 2015
Lunch and Learn:
“Expanding the Clinical Utility of Ultrasound with Advanced Technologies”
Sponsored by Universal Imaging, Inc. and Toshiba
Everyone Welcome
12:30 – 2:00 pm
Ballroom 1-2

Friday, October 9, 2015
Antech Imaging Services Reception
Venue to be announced
You won’t want to miss it!
6:30 pm
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