### Tuesday November 28, 2000

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>7:00 a.m. - 8:00 a.m.</td>
<td>Registration</td>
</tr>
<tr>
<td>8:00 a.m. - 9:00 a.m.</td>
<td>Resident Seminars: Abdominal Radiology&lt;br&gt;Boston-Dallas-Philadelphia Rooms&lt;br&gt;Systematic Evaluation of the Dog &amp; Cat&lt;br&gt;Dr. Lisa Forrest</td>
</tr>
<tr>
<td>9:00 a.m. - 10:00 a.m.</td>
<td>Resident Seminars: Genitourinary System&lt;br&gt;Dr. Dan Feeney</td>
</tr>
<tr>
<td>10:00 a.m. - 10:30 a.m.</td>
<td>Break</td>
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<tr>
<td>10:30 a.m. - 11:30 a.m.</td>
<td>Resident Seminars: Abdominal Masses&lt;br&gt;Dr. Chuck Root</td>
</tr>
<tr>
<td>11:30 a.m. - 12:30 p.m.</td>
<td>Resident Seminars: Abdominal Contrast Procedures&lt;br&gt;Dr. Oscar Ramirez</td>
</tr>
<tr>
<td>12:30 p.m. - 1:30 p.m.</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:30 p.m. - 2:30 p.m.</td>
<td>Resident Seminars: Review of ACVR Certification&lt;br&gt;Abdominal Exam from the Examiner's Perspective&lt;br&gt;Dr. Martha Moon</td>
</tr>
<tr>
<td>2:30 p.m. - 3:30 p.m.</td>
<td>Resident Seminars: Gastrointestinal Radiology&lt;br&gt;Dr. Kathy Beck</td>
</tr>
<tr>
<td>3:30 p.m. - 4:00 p.m.</td>
<td>Break</td>
</tr>
<tr>
<td>4:00 p.m. - 4:30 p.m.</td>
<td>Resident Seminars: Bovine Abdomen&lt;br&gt;Dr. Beth Partington</td>
</tr>
</tbody>
</table>
Wednesday November 29, 2000

7:00 a.m. - 8:00 a.m.  Nuclear Medicine Society Meeting

7:00 a.m. - 1:30 p.m.  Registration

All Day  Poster Session

8:00 a.m. - 10:00 a.m.  Radiology Scientific Session
Boston-Dallas-Philadelphia Rooms

10:00 a.m. - 10:30 a.m.  Break

10:30 a.m. - 10:45 a.m.  President Address ACVR
Dr. Rick Widmer
Boston-Dallas-Philadelphia Rooms

10:45 a.m. - 12:30 p.m.  Keynote Address
E. James Potchen, MD
Michigan State University
"Managing High Technology and Diagnostic Imaging"
Boston-Dallas-Philadelphia Rooms

12:30 p.m. - 1:30 p.m.  Lunch

1:30 p.m. - 2:30 p.m.  Nuclear Medicine Society
Boston-Dallas-Philadelphia Rooms

2:30 p.m. - 3:30 p.m.  Nuclear Medicine Scientific Session
Boston-Dallas-Philadelphia Rooms

3:30 p.m. - 4:00 p.m.  Break

4:00 p.m. - 5:30 p.m.  Nuclear Medicine Scientific Session
Boston-Dallas-Philadelphia Rooms

6:00 p.m. - 8:00 p.m.  Welcome Reception
Boston-Dallas-Philadelphia Rooms
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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| 7:00 a.m. - 8:00 a.m. | Registration  
Ultrasound Society Meeting |
| All Day         | Poster Session  
Ultrasound Society  
- "Current Doppler Applications and Future Directions" - Helen F. Routh, PhD  
- "Essentials of Echocardiography"  
  O. Lynne Nelson, DVM, MS  
  Boston-Dallas-Philadelphia Rooms |
| 8:00 a.m. - 10:00 am |  
  Ultrasound Scientific Session  
  Boston-Dallas-Philadelphia Rooms |
| 10:00 a.m. - 10:30 a.m. | Break |
| 10:30 a.m. - 12:30 p.m. | Ultrasound Scientific Session  
  Boston-Dallas-Philadelphia Rooms |
| 12:30 p.m. - 1:30 p.m. | Lunch |
| 1:30 p.m. - 2:30 p.m. | Radiology Scientific Session  
  Boston-Dallas-Philadelphia Rooms |
| 2:30 p.m. - 3:30 p.m. | The Legal and Ethical Implications of  
Veterinary Telemedicine & E-Health  
  Gregory M. Dennis |
| 3:30 p.m. - 4:00 p.m. | Break |
| 4:00 p.m. - 5:30 p.m. | Film Reading Session  
  Boston-Dallas-Philadelphia Rooms |
### Friday December 1, 2000

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00 a.m. - 8:00 a.m.</td>
<td>Registration</td>
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<tr>
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<td>CT/MRI Society Meeting</td>
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<tr>
<td>All Day</td>
<td>Poster Session</td>
</tr>
<tr>
<td>8:00 a.m. - 10:00 a.m.</td>
<td>ACVR Business Meeting</td>
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<td></td>
<td>Boston-Dallas-Philadelphia Rooms</td>
</tr>
<tr>
<td>10:00 a.m. - 10:30 a.m.</td>
<td>Break</td>
</tr>
<tr>
<td>10:30 a.m. - 12:30 p.m.</td>
<td>CT/MRI Scientific Session</td>
</tr>
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<td></td>
<td>Boston-Dallas-Philadelphia Rooms</td>
</tr>
<tr>
<td>12:30 p.m. - 1:30 p.m.</td>
<td>Lunch</td>
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<tr>
<td></td>
<td>CT/MRI Society</td>
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<tr>
<td></td>
<td>• &quot;MR Imaging of Muscle&quot;</td>
</tr>
<tr>
<td></td>
<td>Mark Schweitzer, MD</td>
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<td></td>
<td>Thomas Jefferson University</td>
</tr>
<tr>
<td>1:30 p.m. - 3:30 p.m.</td>
<td>• &quot;Use of CT in Musculoskeletal Disease&quot;</td>
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<td></td>
<td>Dr. Henri van Bree</td>
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<td></td>
<td>University of Ghent, Belgium</td>
</tr>
<tr>
<td></td>
<td>Boston-Dallas-Philadelphia Rooms</td>
</tr>
<tr>
<td>3:30 p.m. - 4:00 p.m.</td>
<td>Break</td>
</tr>
<tr>
<td>4:00 p.m. - 5:00 p.m.</td>
<td>Radiation Oncology</td>
</tr>
<tr>
<td></td>
<td>Business Meeting</td>
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<td>Boston-Dallas-Philadelphia Rooms</td>
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</tbody>
</table>
Saturday December 2, 2000

7:00 a.m. - 8:00 a.m.  Registration
VRTOG meeting

All Day  Poster Session

8:00 a.m. - 8:30 a.m.  RO Presidential Address
Dr. Susan LaRue
Boston-Dallas-Philadelphia Rooms

8:30 a.m. - 10:00 a.m.  Keynote Address
Rodney Withers, MD
"Quantitating Biology of Cancer Treatment"
Boston-Dallas-Philadelphia Rooms

10:00 a.m. - 10:30 a.m.  Break

10:30 a.m. - 12:30 p.m.  Radiation Oncology Scientific Session
Boston-Dallas-Philadelphia Rooms

12:30 p.m. - 1:30 p.m.  Lunch

1:30 p.m. - 2:00 p.m.  "The Ends of a Survival Curve: Cure or Palliation?"
Dr. Edward Gillette

2:00 p.m. - 2:30 p.m.  "Analyzing and Reporting Veterinary Clinical Trials: A Numbers Game"
Dr. Donald Thrall

2:30 p.m. - 4:00 p.m.  Round Table Discussion on Radiation Therapy Treatment Planning Systems
# General Radiology Session
**Wed Morning Nov 29, 2000**

**Moderator:** Dr. George Henry

<table>
<thead>
<tr>
<th>Starting Time</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>8:00</td>
<td>Detweiler</td>
<td><strong>RADIOGRAPHIC FINDINGS OF CANINE DYSAUTONOMIA: A RETROSPECTIVE STUDY</strong></td>
</tr>
<tr>
<td>8:15</td>
<td>McLear</td>
<td><strong>ATLANTOAXIAL MOBILITY IN THE DOG</strong></td>
</tr>
<tr>
<td>8:30</td>
<td>Thomas</td>
<td><strong>RADIATION EXPOSURE TO PERSONNEL DURING PORTABLE FLUOROSCOPIC IMAGING OF EQUINE LOWER LIMBS</strong></td>
</tr>
<tr>
<td>8:45</td>
<td>Barthez</td>
<td><strong>COMPARISON BETWEEN SINGLE PHASE AND HIGH FREQUENCY GENERATORS FOR X-RAY UNITS</strong></td>
</tr>
<tr>
<td>9:00</td>
<td>Schwarz</td>
<td><strong>OSTEODYSTROPHIA FIBROSA IN TWO GUINEA PIGS WITH A DOUBLE CORTICAL LINE SIGN</strong></td>
</tr>
<tr>
<td>9:15</td>
<td>Schwarz</td>
<td><strong>OSTEOPENIA AND OTHER RADIOGRAPHIC SIGNS IN CANINE HYPERADRENOCORTICISM</strong></td>
</tr>
<tr>
<td>9:30</td>
<td>Smith</td>
<td><strong>CORRELATION OF OFA HIP SCORING TO PASSIVE HIP LAXITY DERIVED FROM THE VENTRODORSAL HIP EXTENDED AND DISTRACTION RADIOGRAPHIC PROJECTIONS</strong></td>
</tr>
</tbody>
</table>
## Nuclear Medicine Session
**Wed Afternoon  Nov 29, 2000**

**Moderator: Dr. Anne Bahr**

<table>
<thead>
<tr>
<th>Starting Time</th>
<th>Presenter</th>
<th>Title</th>
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<tbody>
<tr>
<td>2:30</td>
<td>Bahr</td>
<td><em>IN VITRO AND IN VIVO EVALUATION OF SOLID-PHASE LABELS FOR GASTRIC EMPTYING IN HORSES</em></td>
</tr>
<tr>
<td>2:45</td>
<td>Neickarz</td>
<td><em>THE EFFECT OF METHIMAZOLE ON THYROID UPTAKE OF PERTECHNETATE AND RADIOIODINE IN NORMAL CATS</em></td>
</tr>
<tr>
<td>3:00</td>
<td>Matwichuk</td>
<td><em>COMPARISON OF THE STANDARDIZED UPTAKE VALUE OF FUNGAL-ASSOCIATED INFLAMMATION AND NEOPLASIA IN DOGS WITH NATURALLY OCCurring BLASTOMYCOSIS AND Lymphoma</em></td>
</tr>
<tr>
<td>3:15</td>
<td>Daniel</td>
<td><em>EVALUATION OF HEART TIME-ACTIVITY CURVES AS A PREDICTOR OF HEPATIC EXTRACTION OF <em>99m</em>Tc-MEBROFENIN IN DOGS</em></td>
</tr>
<tr>
<td>4:00</td>
<td>Solano</td>
<td><em>EFFECTS OF ACEPROMAZINE ON THE SKELETAL UPTAKE OF <em>99m</em>Tc-MDP IN TEN HORSES</em></td>
</tr>
<tr>
<td>4:15</td>
<td>Weller</td>
<td><em>COMPARISON OF RADIOGRAPHY AND SCINTIGRAPHY IN THE DIAGNOSIS OF DENTAL DISORDERS IN THE HORSE</em></td>
</tr>
<tr>
<td>4:30</td>
<td>Weller</td>
<td><em>NUCLEAR SCINTIGRAPHY WITH <em>99m</em>Tc-HMPAO LABELLED LEUCOCYTES IN THE ASSESSMENT OF HORSES WITH MALABSORPTION</em></td>
</tr>
<tr>
<td>4:45</td>
<td>Armburst</td>
<td><em>GASTRIC EMPTYING IN CATS USING DIETS VARYING IN FIBER CONTENT AND KIBBLE SHAPES</em></td>
</tr>
<tr>
<td>5:00</td>
<td>Widmer</td>
<td><em>USE OF <em>99m</em>Tc-FOLATE SCINTIGRAPHY FOR IMMUNE MEDIATED ARTHROPATHY</em></td>
</tr>
<tr>
<td>5:15</td>
<td>Barthez</td>
<td><em>SIMPLIFIED METHODS FOR ESTIMATION OF <em>99m</em>Tc-PENTETATE AND <em>131</em>I-ORTHIOODOHIPPURATE (OIH) PLASMA CLEARANCE IN DOGS AND CATS</em></td>
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</tbody>
</table>
# Ultrasound Session

**Thursday Morning Nov 30, 2000**

**Moderator: Dr. Sally Mitchell**

<table>
<thead>
<tr>
<th>Starting Time</th>
<th>Presenter</th>
<th>Title</th>
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<tbody>
<tr>
<td>10:45</td>
<td>O'Brien</td>
<td><strong>SONOGRAPHIC FEATURES OF DRUG-INDUCED SPLENIC CONGESTION</strong></td>
</tr>
<tr>
<td>11:00</td>
<td>Saunders</td>
<td><strong>EVALUATING POWER DOPPLER ULTRASOUND AS A METHOD FOR CLINICAL MONITORING OF TUMOR ANTIANGIOGENIC THERAPY</strong></td>
</tr>
<tr>
<td>11:15</td>
<td>Waller</td>
<td><strong>QUANTITATING ATTENUATION AND BACKSCATTER CHANGES IN LIVER WITH CONTRAST AGENT</strong></td>
</tr>
<tr>
<td>11:30</td>
<td>Reichle</td>
<td><strong>ULTRASONOGRAPHIC AND COMPUTED TOMOGRAPHIC APPEARANCE, VOLUME, AND FUNCTION OF KIDNEYS IN CATS WITH AUTOSOMAL DOMINANT POLYCYSTIC KIDNEY DISEASE</strong></td>
</tr>
<tr>
<td>11:45</td>
<td>Weller</td>
<td><strong>ULTRASONOGRAPHIC ANATOMY OF THE EQUINE TEMPOROMANDIBULAR JOINT</strong></td>
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### General Radiology Session

**Thursday Afternoon Nov 30, 2000**

**Moderator:** Dr. Sally Mitchell

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<thead>
<tr>
<th>Starting Time</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>1:30</td>
<td>Allan</td>
<td><strong>A SURVEY OF VETERINARY RADIOGRAPHY STANDARDS</strong></td>
</tr>
<tr>
<td>1:45</td>
<td>Drost</td>
<td><strong>TEACHING VETERINARY RADIOGRAPHY VIA THE INTERNET</strong></td>
</tr>
<tr>
<td>2:00</td>
<td>Farrow</td>
<td><strong>DIGITAL PHOTOGRAPHY: A GUIDE FOR THE VETERINARY RADIOLOGIST</strong></td>
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<tr>
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<tr>
<td>10:30</td>
<td>Bouma</td>
<td><strong>CT ANGIOGRAPHY: RENAL VASCULAR IMAGING OF THE POTENTIAL FELINE RENAL DONOR</strong></td>
</tr>
<tr>
<td>10:45</td>
<td>Brawer</td>
<td><strong>CT ANATOMY OF THE EQUINE HEAD</strong></td>
</tr>
<tr>
<td>11:00</td>
<td>Wortman</td>
<td><strong>CORRELATION OF LUMBOSACRAL COMPRESSION ON MRI WITH CLINICAL SIGNS IN DOGS WITH DEGENERATIVE LUMBOSACRAL STENOSIS</strong></td>
</tr>
<tr>
<td>11:15</td>
<td>Jones</td>
<td><strong>CONTRAST ENHANCEMENT OF COMPRESSIVE SOFT TISSUES IN THE CANINE LUMBOSACRAL SPINE: ANALYSIS USING CT DENSITOMETRY</strong></td>
</tr>
<tr>
<td>11:30</td>
<td>Kippenes</td>
<td><strong>MAGNETIC RESONANCE IMAGING OF EXTRADURAL SPINAL CORD MASSES – DISTINGUISHING CONTRAST ENHANCING DISC DISEASE FROM NEOPLASIA</strong></td>
</tr>
<tr>
<td>11:45</td>
<td>Morandi</td>
<td><strong>HELICAL AND INCREMENTAL HIGH-RESOLUTION THIN-SECTION PULMONARY COMPUTED TOMOGRAPHY– EVALUATION OF AN ACUTE INFLAMMATORY RESPONSE OF THE CANINE LUNG</strong></td>
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<tr>
<td>Starting Time</td>
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<tr>
<td>10:30</td>
<td>Forrest</td>
<td>HELICAL TOMOTHERAPY</td>
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<tr>
<td>10:45</td>
<td>Pruitt</td>
<td>RADIATION THERAPY UTILIZING MULTIPLE FIELDS WITH NONCOINCIDENT ISOCENTERS IN THE TREATMENT OF NASAL TUMORS IN DOGS</td>
</tr>
<tr>
<td>11:00</td>
<td>LaDue</td>
<td>GEMCITABINE AS A RADIOSENSITIZER FOR CANINE SINONASAL CARCINOMA AND FELINE ORAL SQUAMOUS CELL CARCINOMA</td>
</tr>
<tr>
<td>11:15</td>
<td>McEntee</td>
<td>THE UTILITY OF CONTRAST ENHANCED COMPUTED TOMOGRAPHY IN FELINE VACCINE ASSOCIATED SARCOMAS: 35 CASES</td>
</tr>
<tr>
<td>11:30</td>
<td>Stieger</td>
<td>QUANTITATIVE COMPUTED TOMOGRAPHY AFTER CONFORMAL PROTON THERAPY OF NASAL TUMORS IN DOGS</td>
</tr>
<tr>
<td>11:45</td>
<td>Anderson</td>
<td>DECREASING DOSE PER FRACTION MODIFIES LATE EFFECTS FOLLOWING PELVIC IRRADIATION IN DOGS</td>
</tr>
<tr>
<td>12:00</td>
<td>Walker</td>
<td>PRELIMINARY RESULTS OF POST-SURGICAL IRIDIUM-192 BRACHYTHERAPY FOR VACCINE-ASSOCIATED SARCOMAS IN 18 CATS</td>
</tr>
<tr>
<td>12:15</td>
<td>Thrall</td>
<td>USE OF THE HEAT SHOCK RESPONSE AS A PROMOTER FOR GENE THERAPY</td>
</tr>
<tr>
<td>Author</td>
<td>Title</td>
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<tr>
<td>Matwichuk</td>
<td>A TECHNIQUE FOR MICROAUTORADIOPHGRAPHY USING $^{18}$F-FDG</td>
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<tr>
<td>Matwichuk</td>
<td>UPTAKE OF $^{18}$F-FDG BY FUNGAL-ASSOCIATED INFLAMMATION, NON-FUNGAL INFLAMMATION, AND TUMOR</td>
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<tr>
<td>Nakade</td>
<td>COMPUTED TOMOGRAPHY FEATURES OF BRAIN INFARCTION IN AN AMERICAN PERSIA FELINE ASSOCIATED WITH DIABETES MELLITUS</td>
<td></td>
</tr>
<tr>
<td>Rosenstein</td>
<td>EFFECT OF INCREASING DIETARY CALCIUM AND PHOSPHORUS ON BONE DEVELOPMENT IN GROWING TURKEYS</td>
<td></td>
</tr>
<tr>
<td>Snaps</td>
<td>COMPUTED TOMOGRAPHIC FEATURES OF CANINE NASAL ASPERGILLOSIS</td>
<td></td>
</tr>
<tr>
<td>Snaps</td>
<td>EFFECT OF DEEP DIGITAL FLEXOR TENDON ORIENTATION ON MRI SIGNAL INTENSITY IN EQUINE ISOLATED LIMBS</td>
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</tbody>
</table>
Areas of Legal Concern. Veterinarians engaged in the practice of veterinary medicine by telecommunication (“telemedicine”), such as veterinary radiology, may need to consider among other things, whether he/she needs to be licensed in any country, state, province or locality (“jurisdiction”), and/or is subject to the laws of jurisdictions to which its telemedicine practice is available? Whether he/she may only act as a *bona fide* consultant to a attending veterinarian in the other jurisdiction? Which jurisdiction’s laws determine applicable malpractice standards? Can he/she issue prescriptions? Confidentiality of telemedicine communications? Tax liability and reporting obligations to jurisdictions to which the veterinarian’s telemedicine practice is available? Permissible business structures for the telemedicine practice? International and national telecommunications laws, etc.

What is “telemedicine”? Many jurisdictions and international organizations have defined human “telemedicine.” In 1999 Oklahoma became the first jurisdiction to define “veterinary telemedicine.” E.g., “The transmission of diagnostic images such as, but not limited to, radiographs, ultrasound, cytology, endoscopy, photographs and case information over ordinary or cellular phone lines to a validly licensed [Oklahoma] veterinarian or board certified medical specialist for the purpose of consulting regarding case management with the primary care veterinarian who transmits the cases.”

“Consulting Veterinarian” Engaged Unlawful Practice? While many jurisdictions permit a veterinarian in its jurisdiction to consult a veterinarian in another jurisdiction, this exception may not be available to an out-of-state telemedicine veterinarian who directly communicates with a client in that jurisdiction or who as a part of his/her veterinary practice regularly engages in telemedicine consults.

“Passive” vs. “Interactive” Internet Telemedicine. Courts appear to be more willing to exercise jurisdiction over an out-of-state practitioner who has an “interactive” website as compared to a “passive” website.

Veterinary Telemedicine Malpractice. Many court decisions have held a professional who allegedly committed malpractice during a phone call or fax transmission into that jurisdiction, subject to a malpractice action in that jurisdiction. Likewise, if the malpractice did not happen during the phone call or fax transmission but, rather by other means, not subject to a lawsuit in that jurisdiction. The same rationale is likely to apply to internet malpractice claims. Telemedicine veterinarians who provide a diagnosis, give medical advice, have medical records or information sent from the client’s jurisdiction to the veterinarian to review, who arrange to have laboratory tests or examinations done where the animal is and then reported to them, recommend what treatment should or should not be provided, prescribe medications and/or charge a fee may find themselves subject a malpractice claim in another jurisdiction. Also, to a claim by the licensing authority in that jurisdiction that the veterinarian has engaged in the unlawful practice of veterinary medicine in that jurisdiction.

Conclusion. As the above and other issues emerge, veterinarians have a unique opportunity to play an important role in determining how the law should respond to veterinary telemedicine. Veterinarians should not be left out in the cold when the law begins addressing and answering these and other questions.
INTRODUCTION – Canine dysautonomia is an idiopathic condition resulting in loss of autonomic nervous system function. In 1983, Rochlitz and Bennett first reported the disease in England. But it wasn’t until 1991 that the first case was suspected to have occurred in the United States. The prevalence of dogs diagnosed with dysautonomia in the mid-western United States has recently increased due to increased occurrence or awareness of the disease.

MATERIALS AND METHODS – The records and radiographic findings of 23 cases of canine dysautonomia seen between July of 1993 and January of 2000 were reviewed. Cases were diagnosed either at necropsy by finding the characteristic changes within the autonomic ganglia, or clinically, by observing a reaction to 3 pharmacological challenges.

RESULTS – A diagnosis of dysautonomia was reached in 17 (71%) dogs in this population by postmortem examination of the peripheral autonomic ganglia. Six (25%) of the dogs in this study were diagnosed by having results to the 3 previously mentioned pharmacological challenges consistent with dysautonomia. One (4%) dog had responses to 2 of the 3 tests.

The radiographic findings suggestive of dysautonomia were sometimes mild and spanned the 3 organ systems. These included aspiration pneumonia, megaesophagus, or a distended stomach, small bowel, or urinary bladder. A summary of these radiographic findings is shown below.

<table>
<thead>
<tr>
<th></th>
<th>Thorax (n=23)</th>
<th>Abdomen (n=20)</th>
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<tbody>
<tr>
<td><strong>Esophagus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>39%</td>
<td>Normal</td>
</tr>
<tr>
<td>Distended</td>
<td>61%</td>
<td>Distended</td>
</tr>
<tr>
<td><strong>Lungs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>39%</td>
<td>Normal</td>
</tr>
<tr>
<td>Diseased</td>
<td>61%</td>
<td>Distended</td>
</tr>
<tr>
<td><strong>Stomach</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>35%</td>
<td>Normal</td>
</tr>
<tr>
<td>Distended</td>
<td>65%</td>
<td>Distended</td>
</tr>
<tr>
<td><strong>Small Bowel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>50%</td>
<td>Normal</td>
</tr>
<tr>
<td>Distended</td>
<td>50%</td>
<td>Distended</td>
</tr>
<tr>
<td><strong>Bladder</strong></td>
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<tr>
<td>Normal</td>
<td>55%</td>
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<tr>
<td>Distended</td>
<td>45%</td>
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DISCUSSION – Radiographic findings of canine dysautonomia are variable but can add the disease to a list of differential diagnoses. Megaesophagus, aspiration pneumonia, and distension of the stomach, small bowel, and/or urinary bladder are all radiographic abnormalities associated with the disease. In some instances, radiographic patterns of gas and/or fluid distension of the small bowel mimicked mechanical obstruction of the organ, allowing the disease to be misdiagnosed.
ATLANTOAXIAL MOBILITY IN THE DOG

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Introduction: Diagnosis of atlantoaxial instability in the dog may be hindered by the lack of an established normal range of motion of this joint. To our knowledge, there is only one published study of atlantoaxial joint motion in normal dogs. That study was limited to Beagle dogs in a closed breeding colony, which may not have been representative of all dog breeds. The purpose of this study was to 1) determine the normal range of motion of the atlantoaxial joint in a population of otherwise normal subjects undergoing myelography for non-cervical spinal disease, and 2) compare these values with those of patients diagnosed with atlantoaxial instability.

Methods: 47 dogs with thoracic or lumbar spinal cord disease and no history of neck pain or forelimb paresis underwent myelography. Following injection of intrathecal contrast (Iohexol 240), lateral radiographs of the atlantoaxial joint in extreme dorsal extension and ventral flexion were performed. The radiographs were evaluated for evidence of spinal cord compression at the atlantoaxial joint. Measurements of the overlap between the dorsal spinous processes of the atlas and axis were made, and the linear range of motion between flexion and extension was calculated. The angle between the long axis of the atlas and of the axis was measured, and the angular range of motion between flexion and extension was calculated.

Results: Subjects included both toy and giant breed dogs, with a range in weight from 4.2-81.9kg. None of the normal subjects showed radiographic evidence of compression of the spinal cord at the atlantoaxial joint during flexion or extension. Overlap of the dorsal spinous processes in a neutral position ranged from 1.5-18.7mm, with a median of 7.4mm. The linear range of motion of the dorsal spinous processes ranged from 0.7mm-12.2mm, with a median of 5.8mm. The angle between the dorsal spinous processes ranged from 169º-197º with a median of 185º in a neutral position, and from 162º-189º with a median of 175º in a flexed position. The angular range of motion of the dorsal spinous processes was -3º–38º with a median of 18º. Eight dogs with a diagnosis of atlantoaxial instability had radiographs available for evaluation. Of those animals, overlap of the dorsal spinous processes averaged -2.2mm, and the angle between the dorsal spinous processes averaged 146º. Both of these values are significantly different (p < 0.01) than those of normal animals.

Conclusion: The atlantoaxial joint is a dynamic joint in the normal dog. There is a normal linear range of motion which may result in minimal overlap between the dorsal spinous processes of the atlas and axis, mimicking the distraction seen in cases of atlantoaxial instability. In addition, there is a normal angular range of motion at the atlantoaxial joint, but this angle never measured less than 162º in our normal patient population, while all but one affected dog measured less than 162º. Thus, a decrease in the angle between the atlas and axis was more predictive of atlantoaxial instability than was a decrease in atlantoaxial overlap.
RADIATION EXPOSURE TO PERSONNEL DURING PORTABLE FLUOROSCOPIC IMAGING OF EQUINE LOWER LIMBS

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INTRODUCTION: Fluoroscopic imaging has been used with increasing frequency in veterinary medicine. In equine practice, a relatively new hand-held portable fluoroscopic unit has gained popularity for detection of orthopedic injuries and as a survey tool during prepurchase examinations¹. The deleterious effects of exposure to ionizing radiation are well known and can be extensive. Many users of the portable fluoroscopic systems described above seem to be under the impression that personal protection against primary and stray radiation is totally unnecessary, despite instructions to the contrary in the manual from the manufacturer. The objectives of the study were to determine: 1) the radiation exposure to personnel during portable fluoroscopic imaging of equine lower limbs, and 2) a “safe” distance from the c-arm at which no radioprotective clothing is required.

METHODS: Exposure rates were mapped in 4 directions around the suspended c-arm of a portable fluoroscopy unit, while imaging fetlocks, carpi and tarsi of cadaver limbs. Exposure rates were also measured at 3 sites (tube and image intensifier hands and thyroid region) of the c-arm operator, as well as at the assistant’s thyroid, during examination of fetlocks, carpi and tarsi of 5 live horses. Average examination times for fetlocks, carpi and tarsi were also measured, by observation of an experienced practitioner.

RESULTS: Exposure rates are highly dependent on direction relative to the c-arm, and were consistently highest on the tube side. Radiation exposure remained significantly above background levels until approximately 4.7 ± 0.4m away from the c-arm, depending on the direction. During examination of a live horse, radiation exposure was consistently highest at the operator’s tube hand. The radiation exposure to the operator during a typical fluoroscopic examination is approximately 10 times and 32 times greater at the thyroid and hand, respectively, when compared to a radiographic examination of the same joint.

CONCLUSION: Fluoroscopic imaging of equine lower limbs represents a serious radiation safety hazard. Recommended annual maximum permissible dose limits will be rapidly exceeded if lead-containing protective clothing is not worn during fluoroscopic imaging. There is no "safe" distance from the c-arm for personnel within the same room.

1. Equiscan, Model 1000-1, Xi-Tec Inc, East Windsor, Conn.
COMPARISON BETWEEN SINGLE PHASE AND HIGH FREQUENCY GENERATORS FOR X-RAY UNITS.

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Introduction : The purpose of this study was to compare characteristics and performances between single phase (SP) and high frequency (HF) generators for x-ray units dedicated to veterinary radiology practice.

Methods : A 30 kW SP and a 30 kW HF generator connected to a rotating anode x-ray tube were used for the study. Source-film distance, screen/film combination and film processing were kept the same during the experiment. The mAs value yielding a similar film density of a stair step phantom, as assessed by a densitometer and a similar dose, as assessed by a solid state detector, was estimated for different kVp values. The ratio of the mAs used with the SP generator and the equivalent mAs used with the HF generator to produce similar film density or radiation dose was calculated. The waveform of the tube current was recorded for the 2 generators using an oscilloscope. Motion artifact was produced on a lateral radiograph of a canine tarsus using the 2 generators. Reproducibility was assessed by measuring the film density of the central step of the phantom on 10 consecutive images produced using the same radiographic parameters with the 2 generators and an F-test was performed to compare variances of the film density measures. Scattered radiation was measured with a solid state detector 30 cm away from a dog during lateral thoracic radiograph with the 2 generators.

Results : mAs ratios to obtain similar film density ranged from 2 (for 90 kVp) to 2.5 (for 70 kVp) and mAs ratios to obtain similar radiation dose ranged from 1.2 (for 100 kVp) to 1.4 (for 70 kVp). Current waveform for the SP generator was half-sinusoidal as it was almost continuous for the HF generator. Motion artifact appeared as blur for the SP generator and as several regularly placed images of the subject for the HF generator. Reproducibility was significantly better for the HF than for the SP generator (P=0.047). Scatter radiation measured at 30 cm from the same patient during thoracic examination was 3.5 µGy for the SP generator and 2.5 µGy for the HF generator.

Conclusion : With the HF generator the mAs value needed to obtain the same overall film density was approximately half of that needed with the SP generator, with better reproducibility, and less radiation dose. Motion artifact appears differently due to different current waveform.
OSTEODYSTROPHIA FIBROSA IN TWO GUINEA PIGS WITH A DOUBLE CORTICAL LINE SIGN

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Introduction:
Radiographic detection of osteopenia is difficult unless structural changes are visible. The double cortical line sign is one of the few pathognomonic Roentgen signs of osteopenia which has been reported in man and in only one veterinary report.\(^1\),\(^2\),\(^3\) Osteodystrophia fibrosa is a well recognised condition in many species but has not been reported in Guinea pigs to date.

Material & Methods:
Radiographs of 2 adult Guinea pigs with signs of lethargy and reluctance to walk, otitis media and dental disease were evaluated. Both animals were fed with a commercial muesli-type diet for Guinea pigs throughout their life and were euthanized 2 weeks after initial presentation due to deteriorating conditions and poor prognosis. Post mortem examination, osteodensitometry and histopathological examination were carried out.

Results:
Radiographically, a coarse trabecular bone pattern, skeletal deformation, pathological fractures, a double cortical line sign on several long bones, pelvis and vertebrae, and polyarthritic degenerative joint disease were found in both animals. A radiological diagnosis of osteopenia was confirmed with dual-energy X-ray absorptiometry. Microscopic examination revealed a marked fibrous osteodystrophy (OF). Analysis of a food sample from one case revealed a calcium and phosphorus content of 0.524 % and 0.425 % respectively (Ca:P ratio: 1.23:1). Nutritional secondary hyperparathyroidism due to Ca-P imbalance was considered to be the underlying cause of OF in both cases.

Discussion:
Due to the arrangement of the arterial bony blood supply there is preferential bone resorption of the middle layers of the cortex resulting in a residual outer and inner cortical layer of bone. The resulting double cortical line is particularly useful as a pathognomonic radiographic finding of osteopenia in a variety of species with different bone sizes and morphologies. Osteodystrophia fibrosa due to nutritional hyperparathyroidism should be considered in the differential diagnosis of generalized osteopenia in Guinea pigs.

References:
OSTEOPENIA AND OTHER RADIOGRAPHIC SIGNS IN CANINE HYPERADRENOCORTICISM

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Introduction:
Purpose of the study was to investigate the specificity of conventional radiography in the assessment of canine hyperadrenocorticism by comparing the occurrence of related radiographic findings to those in dogs with other obesity inducing conditions. In addition, the effect of obesity on the radiographic appearance of bone was studied on a canine cadaver specimen.

Material & Methods:
Radiographs of 24 hyperadrenocorticoid, 15 diabetic and 20 hypothyroid dogs were screened for the presence of adrenomegaly, adrenal mineralisation, calcinosis cutis, hepatomegaly, obesity, bronchial and pulmonary mineralisation and osteopenia of lumbar vertebrae, ribs and at least one long bone. In a cadaver study a dissected lumbar spine of a healthy dog was radiographed with and without a superimposed and interposed 10cm thick fat block with high detail and high speed screens.
For the clinical study, analysis of variance (ANOVA) was used to investigate differences between groups in respect of age, body weight and sex. Kruskal-Wallis one-way analysis of variance by ranks was used to compare categorical parameters relating radiographic findings between groups.

Results:
The 3 groups of dogs were statistically comparable with regard to the distribution of age, sex and body weight. Decrease in radiographic bone density was present in all disease groups but without statistically significant difference in the profile of alteration. There was no significant variation between disease groups regarding obesity, hepatomegaly, contour of the caudoventral hepatic margin and peripheral bronchial mineralisation. Significantly more hyperadrenocorticoid dogs had perihilar bronchial mineralisation and it was significantly more severe in these dogs. Only hyperadrenocorticoid dogs showed adrenal mineralisation and calcinosis cutis, but these were rare findings (2/24; 3/24). Adrenomegaly was present in 2 hyperadrenocorticoid dogs but was also misdiagnosed in one diabetic dog.
In the cadaver study fat superimposed on the spine created a spurious decrease in radiographic bone density. The effect was more marked if the fat block was interposed and if fast screens were used instead of detail screens.

Discussion:
The low specificity in almost all common signs and the low incidence of characteristic findings showed the limited potential of conventional radiography in canine hyperadrenocorticism. Radiographic assessment of bone density of the lumbar spine is unreliable because of artefactual osteopenic effects of Compton scatter related to the high kVp settings necessary for obese dogs. Screens with a high intensification factor necessary for thick body parts and increased object film distance, caused by obesity, also further decrease image definition and reduce detectability of fine trabecular bone pattern.
CORRELATION OF OFA HIP SCORING TO PASSIVE HIP LAXITY DERIVED FROM
THE VENTRODORSAL HIP EXTENDED AND DISTRACTION RADIOGRAPHIC
PROJECTIONS

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Introduction - Historically, the standard ventrodorsal hip-extended radiographic projection has
been used to assess canine hips. If no subluxation/luxation (laxity) or degenerative joint disease
(DJD), the hips have been presumed to be phenotypically normal and, therefore, accepted for
breeding. Estimating the genotype of hip dysplasia from the phenotype is influenced by the
inherent accuracy or inaccuracy of the diagnostic method of evaluation. The purpose of this study
was to correlate the OFA hip scoring phenotype with hip laxity on both the ventrodorsal hip-
extended and distraction projections.

Materials and Methods - A cross-section of 306 dogs 24 months of age or older representing 54
breeds were evaluated for hip dysplasia. All dogs were presented for routine screening of the hips
with no evidence of lameness. Standard ventrodorsal hip-extended radiography and
compression/distraction radiography were performed for each dog. The ventrodorsal hip extended
radiograph for each dog was sent to the OFA for their evaluation. Quantitative laxity
measurements were made on all radiographic projections. Norberg angles from the hip-extended
view and distraction index from the distraction view were measured for each dog.

Results - Subjective OFA scoring determined that 219/306 (71.5%) of the dogs had phenotypically
normal hips, however, of the normal dogs 196/219 (89.5%) had a DI of greater than 0.3 and
111/219 (50.7%) had a NA of less than 105°. The mean DI and NA for dogs determined by the
subjective scoring method to have an excellent hip phenotype were 0.33 and 107° (range: 0.14-
0.61 and 99-119°) respectively. The mean DI and NA for good hip phenotype by subjective score
were 0.39 and 105° (range: 0.15-0.77 and 88-120°) respectively. The mean DI and NA for dogs
determined to have fair hip phenotype by subjective score were 0.49 and 102° (range 0.14-0.91
and 91-114) respectively. Subjective OFA scoring determined 48/306 (15.7%) of the dogs to be
phenotypically abnormal, and of those dogs 7/48 (14.5%) had a NA greater than 105° and 3/48
(6.3%) had a DI less than 0.3.

Discussion and Conclusion – Canine hip dysplasia (CHD) is defined by either joint laxity or DJD,
with measured laxity earlier in life being the primary risk factor for later development of DJD. In a
comparison of 3 scoring methods to assess hip integrity (subjective OFA score, DI and NA), it was
determined that a wide range of passive hip laxity existed in dogs that were judged phenotypically
normal by the subjective score. Fifty percent of the OFA certified dogs had NA's of <105°
indicating that this frequently cited standard used by other hip screening programs is not observed
by the OFA. Some dogs were certified as normal for breeding with NA's as low as 88%.
Reasonably good agreement among methods was observed for dogs judged to be abnormal by the
OFA (e.g. a high percentage of failed dogs had loose hips using NA and DI). To make genetic
improvements in lowering the frequency of CHD, breeding recommendations should be based on
breeding those dogs with phenotypically tighter hips based on an accurate quantitative scoring
method. Results of this study confirm that the subjective scoring method on the ventrodorsal hip-
extended projection underestimates the passive hip laxity in a high percentage of dogs certified as
normal for breeding.
IN VITRO AND IN VIVO EVALUATION OF SOLID-PHASE LABELS FOR GASTRIC EMPTYING IN HORSES.

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Introduction: Evaluation of solid-phase gastric emptying in horses has the potential to be a useful tool in research animals to evaluate the effect of drugs, stress, surgical procedures and eventually may be useful in clinically assessing patients with naturally-occurring diseases. In the past, solid-phase emptying in horses has been assessed using $^{99m}$Tc-sulfur colloid cooked in egg. This is not a normal physiologic meal for a horse and often requires invasive measures, such as nasogastric intubation, for administration. Ideally, an appropriate test meal should be based on a typical diet for the animal and should provide stable binding of the radiolabel.

Purpose: To evaluate the suitability and in vitro and in vivo stability of several test meals based on typically fed equine diets.

Methods: In Vitro Testing: Duplicate samples of Purina Horse Chow® 100, Omelene® 100 or Bermuda grass hay were labeled with 3 mCi in 1 ml volume of either $^{99m}$Tc-mebrofenin, $^{99m}$Tc-disofenin or $^{99m}$TCO4-. The samples were incubated at room temperature for 10 min and then divided into equal parts and placed in conical centrifuge tubes. 5 ml of either water or endoscopically-obtained gastric juice was also added to the tubes. The tubes were then placed on a shaker table in a water bath held at 37°C. After 1 hr, an additional 2.5 ml of water was added to all tubes which were then incubated an additional 2 hours. The tubes were then centrifuged for 20 min and the solid pellet and supernatant were separated. The tubes were then counted in a well detector. Percent solid phase retention was subsequently calculated. This procedure was repeated 2 more times over succeeding days.

In Vivo Testing: Five test scans were performed in a total of 4 mature Quarter Horse Cross geldings after feeding 1, 2, 3, 4, or 5 pounds of Purina Horse Chow® 100 labeled with $^{99m}$Tc-mebrofenin. The left side of the abdomen (including the stomach) as well as the cervical region and caudal abdomen were imaged over a 6 hr period. At 1 and either 3 or 6 hrs, a blood sample was obtained and counted in a well detector along with a standard dilution made from the same radiopharmaceutical kit used to label the food.

Results: Purina Horse Chow® 100 labeled with mebrofenin showed the highest average percent solid phase retention with the samples incubated in gastric juice being slightly higher than those in water (92%±4 vs 93%±2 respectively). Disofenin and Technetium yielded consistently lower percent solid-phase retention. Omelene® 100 was intermediate in percent solid-phase labeling. Bermuda grass hay did not produce acceptable labeling of any radiopharmaceutical. The horses used for the in vivo study readily ate the test meal in 25 minutes or less. At no time during imaging was there any activity detected outside of the gastrointestinal tract. Quantitation of the plasma activity obtained at 1.3 and/or 6 hours showed less than 0.2% of the total activity administered to be detectable in the vascular space.

Conclusions: Purina Horse Chow® 100 labeled with $^{99m}$Tc-mebrofenin appears to be an acceptable physiologic test meal which can be used to evaluate solid-phase emptying in horses.
The Effect of Methimazole on Thyroid Uptake of Pertechnetate and Radioiodine in Normal Cats

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Introduction: Radioiodine is common therapy for feline hyperthyroidism. Many cats are treated with antithyroid drugs prior to radioiodine treatment. The effect of previous or concurrent antithyroid medication on radioiodine therapy and thyroid imaging is not known. The purpose of this study was to determine the magnitude and duration of effect by methimazole on thyroid uptake of $^{125}$I and $^{99m}$TcO$_4$.

Materials and Methods: Baseline serum T$_4$ concentrations, $^{99m}$TcO$_4$ and $^{123}$I thyroid scintigraphy were performed in 8 normal adult male cats. Quantitative analysis was used to determine the % dose uptake of $^{99m}$TcO$_4$ and $^{123}$I by the thyroid gland and the Thyroid:Salivary (T:S) of $^{99m}$TcO$_4$. Methimazole was administered to 5 cats until subnormal serum T$_4$ concentrations were obtained. Three cats remained as non-treatment controls. $^{99m}$TcO$_4$ and 8 hour (early phase) and 24 hour (delayed phase) $^{123}$I thyroid images were repeated. Methimazole therapy was discontinued and $^{123}$I thyroid images and serum T$_4$ concentrations were repeated at 1, 4, 9, 15, and 24 days. Statistical analyses were performed by SigmaStat using ANOVA and Tukey Test with a significance set at P<0.05.

Results: The % dose uptake of $^{99m}$TcO$_4$ increased throughout the acquisition period with maximum uptake occurring at 4 hours during baseline scans and at time of maximum suppression. The baseline 20 minutes T:S ratio was 0.804 ± 0.05 (mean ± SD) and reached a peak value of 1.31 ± 0.18 at 4 hours post radioisotope administration. The 20 minutes T:S ratio at maximum T$_4$ suppression was 1.36 ± 0.23, which was significantly greater than the controls (0.72 ± 0.13). There was a significant increase in the T:S ratio in the treatment group at all time points as compared to controls.

Baseline, early and late phase % dose uptakes of $^{123}$I were 2.1 ± 0.42% and 7.04 ± 1.24% (mean ± SD) respectively. Early phase % dose uptake of $^{123}$I at days 1, 4, and 9 post methimazole withdrawal were significantly increased in treatment cats and peaked at 4 days. The early phase % dose uptake decreased and were not significantly different from control cats on days 15 and 24. The early phase percent dose uptake of $^{123}$I and $^{99m}$TcO$_4$ at 4 hours were highly correlated (R= 0.809). The delayed phase % dose uptake of $^{123}$I in treatment cats was significantly greater than for control cats at 4 and 9 days post methimazole withdrawal. The delayed phase % dose uptake peaked at 9 days post withdrawal, then decreased and by day 15 was not significantly different than controls. The delayed phase % dose uptake of $^{123}$I did not correlate with $^{99m}$TcO$_4$ percent dose uptake (R= 0.232).

Discussion: Methimazole reportedly does not adversely affect thyroid imaging with $^{99m}$TcO$_4$; however, our data indicates that the trapping of $^{99m}$TcO$_4$ and $^{123}$I is significantly increased in normal cats concurrently receiving antithyroid medication. The increased uptake of $^{99m}$TcO$_4$ and early phase $^{123}$I at maximum T$_4$ suppression in the methimazole induced hypothyroid cats likely represents enhanced trapping secondary to elevated TSH levels. This effect persisted for up to 15 days. This enhanced uptake observed after discontinuing methimazole is supportive of a “short term rebound effect” which has been previously reported.
COMPARISON OF THE STANDARDIZED UPTAKE VALUE OF FUNGAL-ASSOCIATED INFLAMMATION AND NEOPLASIA IN DOGS WITH NATURALLY OCCURRING BLASTOMYCOSIS AND LYMPHOMA

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Introduction

Whole body positron emission tomography (PET) imaging with fluorine-18 fluorodeoxyglucose (\(^{18}\text{F}-\text{FDG}\)) is widely used for tumor imaging in people. Benign inflammatory lesions typically have less uptake of \(^{18}\text{F}-\text{FDG}\) than do malignant neoplasms, allowing for discrimination between benign and malignant disease. The few reported cases suggest that uptake of \(^{18}\text{F}-\text{FDG}\) by fungal lesions is greater than for other benign lesions, and may be as high or higher than for malignancies. Consequently, accumulation of \(^{18}\text{F}-\text{FDG}\) in fungal-associated inflammation has resulted in false positive diagnosis for tumor. This study was undertaken to measure uptake of \(^{18}\text{F}-\text{FDG}\) by fungal lesions using the standardized uptake value (SUV), and to see if the SUV would permit distinction between fungal inflammation and neoplasia.

Materials and Methods

Five dogs with a confirmed diagnosis of blastomycosis, and three dogs with a confirmed diagnosis of lymphoma underwent whole body \(^{18}\text{F}-\text{FDG}\) PET prior to treatment. Images were read by a nuclear medicine physician aware of the diagnosis but unaware of known sites of disease. Accessible areas of increased \(^{18}\text{F}-\text{FDG}\) accumulation were sampled by fine needle aspiration to confirm the nature of the lesion. The maximum SUV was calculated for lesions measuring > 2 cm diameter. The mean SUV of \textit{Blastomyces}-associated inflammatory lesions was compared with the mean SUV of the neoplastic lesions using a student’s t-test.

Results

SUVs were calculated for 13 lesions from 5 dogs with blastomycosis. The mean +/- sd SUV for the 13 lesions was 7.7 +/- 2.0. SUVs were calculated for 17 lesions from 3 dogs with lymphoma. The mean +/- sd SUV for these 17 lesions was 4.8 +/- 1.8. The mean SUV of \textit{Blastomyces}-associated inflammation was significantly higher than the mean SUV for lymphoma (p < 0.001).

Conclusion/Clinical Implications

SUVs for fungal-associated inflammation appear to be higher than for other benign lesions reported in the literature. SUVs for \textit{Blastomyces}-associated inflammation were significantly higher than for neoplastic lesions in this study. The SUV could potentially be used to distinguish fungal-associated inflammation from neoplasia, but this ability is limited by overlap of the SUVs for the two types of lesions.
EVALUATION OF HEART TIME-ACTIVITY CURVES AS A PREDICTOR OF HEPATIC EXTRACTION OF $^{99m}$Tc-MEBROFENIN IN DOGS.

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INTRODUCTION: Many scintigraphic methods have been used to quantify hepatic function. Most of these techniques measure the uptake of a hepatobiliary radiopharmaceutical by the liver as a measure of hepatic parenchymal cell function. Hepatic extraction fraction (HEF) has been used to assess hepatic parenchymal cell function in man, dogs, and cats. We have used deconvolutional analysis for quantification of all hepatobiliary studies since 1994. The procedure is difficult for many reasons. The purpose of this study was to determine if parameters derived from analysis of a heart time-activity curve could be used as an alternative to deconvolutional analysis.

MATERIAL AND METHODS: Retrospective analysis of data from previous hepatobiliary projects was used in this study. The data analyzed was from 21 conditioned, mongrel dogs. Eleven of these dogs were used as normal controls. In 10 remaining dogs, various degrees of hepatic parenchymal cell damage was induced by either carbon tetrachloride or thiacetarsamide. Heart time-activity curves, created following intravenous injection of $^{99m}$Tc-mebrofenin, were normalized and the area under the curve from 0-30 minutes and 0-60 minutes were determined. In addition, the half-time clearance rate of the heart time-activity curve was analyzed using a two-compartment model. Hepatic extraction was determined by mesenteric venous injection of $^{99m}$Tc-mebrofenin. ROIs were placed over the heart and liver. A two-compartment model was used to calculate the hepatic extraction of $^{99m}$Tc-mebrofenin.\textsuperscript{14} The forward ($k_1$) and reverse ($k_2$) rate constants were determined by a simple graphical method using linearized time activity data. Linear regression analysis was used to describe the relationship between the area under the normalized heart time-activity curve and hepatic extraction.

RESULTS: There was good correlation between the area under the normalized heart time-activity curve and hepatic extraction. The best correlation was obtained from the 0-30 minute data ($r^2 = 0.92$). A formula for calculating hepatic extraction was derived using linear regression analysis: Hepatic extraction = $1.092 - (0.0000308 \times \text{AUC}_{0-30 \text{ minutes}})$. There was good correlation between the half-time clearance rates from the heart time-activity curve and hepatic extraction. The best correlation was between the fast phase half-time clearance and hepatic extraction ($r^2 = 0.88$).

DISCUSSION: In conclusion, we found the area under a normalized heart time-activity curve is a good predictor of hepatic extraction. The area from 0-30 minutes had a better correlation than the 0-60 minute data and would be easier to obtain. The area under the normalized heart time-activity curve was easier to calculate than the half-time clearances of the curve and had higher correlation with hepatic extracton. Hepatic extraction can be predicted using the linear regression formula and could be used as a simple alternative to deconvolutional analysis.
EFFECTS OF ACEPROMAZINE ON THE SKELETAL UPTAKE OF $^{99m}$Tc- MDP IN TEN HORSES

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Introduction and Purpose: Approximately 10% of horses undergoing skeletal scintigraphy at Tufts University School of Veterinary Medicine have shown a generalized low density radiopharmaceutical bone uptake, significantly reducing the diagnostic value of the scan. This phenomenon, commonly seen in heavy breeds cannot be explained by technical difficulties associated with the scanning procedure. A poor diagnostic quality scan result in loss of time and money for the horse owner and unnecessary radiation exposure to the technical staff involved in the procedure. Acepromazine maleate is a well-known phenothiazine tranquilizer commonly used in equine practice. In addition to its sedative and preanesthetic properties, acepromazine has been used as a peripheral vasodilating agent. The purpose of the present study is to test the hypothesis that an increased in blood supply caused by the vasodilating effect of acepromazine will deliver more radiopharmaceutical to the bone.

Materials and Methods: 10 adult horses (at least 1300 lb of body weight) presented to the hospital for clinical evaluations of lameness were used. Two Three-phase bone scans of the fore and hindlimbs were performed. Animals were divided in two groups. Group A-(10 animals): Immediately after 200 mCi of $^{99m}$TC-MDP was injected intravenously and as a bolus, a dynamic acquisition protocol of 45 frames at 4 seconds per frame was executed. The soft tissue phase was acquired using a dynamic acquisition protocol of 4 frames at 60 seconds per frame recorded 5 to 12 minutes after injection. Time-based static images were acquired for the bone phase 3 hours after radiopharmaceutical injection. Group B- (10 animals): Forty-eight hours after the initial scan described above, a second three-phase bone scan was performed in the same population of horses. All procedures were performed as described in group A with the exception of intravenous injection of 0.066 mg/kg of body weight of acepromazine maleate 10 minutes before injection of the $^{99m}$TC-MDP. All scintigraphic images were time and decay-corrected. Recorded scintigraphic images were recalled from the computer and time activity curves of the vascular phase were generated. Separate standardized regions of interest were drawn in selected areas in the soft tissue and bone phases. A Student T test was performed to determine differences in count density between experimental groups during the vascular, soft tissue and bone phases of the scans. A subjective assessment of the quality of the microdot-generated scintigrams was performed by 3 radiologists working independently from each other and with no previous knowledge of the experimental design.

Results: There was a trend (data awaits statistical analysis) for blood flow to peak earlier in group B. Subjectively, bone scan quality was the same after injection of acepromazine.

Conclusion: Preliminary analysis of the data suggests that the vasodilatation and increased blood flow caused by intravenous injection of acepromazine in horses did not increase the count density of the bone phase scintigrams. The diagnostic quality of the skeletal scintigram was not improved by intravenous injection of acepromazine in the present population of horses. Discussion of the final results and of the conclusions will be made during the presentation.
COMPARISON OF RADIOGRAPHY AND SCINTIGRAPHY IN THE DIAGNOSIS OF DENTAL DISORDERS IN THE HORSE

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Purpose: Scintigraphy with $^{99m}$Tc-MDP and $^{99m}$Tc labelled leucocytes was compared to radiography in the diagnosis of dental disease in the horse.

Methods: The study was designed as a prospective case-controlled study, comprising 30 horses with clinical signs of dental disease and 30 control horses. In each case, right and left lateral, ventral and dorsal soft tissue and bone phase scintigraphic images were obtained after intravenous injection of 1 GBq/100kg $^{99m}$Tc-MDP, using a gamma camera. The same views were acquired in 10 horses with clinical signs of dental disease and 12 control horses after injection of $^{99m}$Tc labelled leucocytes. Standard radiographic projections of the paranasal sinuses and of the apices of the maxillary and mandibular teeth were obtained. The scintigraphs and radiographs were assessed subjectively by three board certified surgeons with extensive experience of equine radiology from whom the clinical history was withheld. Sensitivity, specificity and kappa, as a measure of agreement, were calculated for the different methods. Bone phase images were also scored subjectively on a scale from 0 to 3 on the basis of isotope uptake over the teeth. Regions of interest were defined over the teeth and normal teeth compared to diseased ones. Total scintigraphic counts were related to the age of the animal and to the disease process. Differences in density ratios between left and right teeth were evaluated using the Mann-Whitney Test.

Results: Dental disease was confirmed in 22 horses at surgery or post mortem examination. Horses with dental disease showed a significant increase in scintigraphic activity over the affected tooth compared to the contralateral tooth, with a typical pattern for different diseases. The sensitivity of scintigraphy with $^{99m}$Tc – MDP proved to be excellent (95.5%), whereas the specificity was moderate (86.4%). In contrast radiography had excellent specificity (95.0%) and a low sensitivity (51.5%). The greatest sensitivity and specificity were achieved by evaluating radiographs and scintigrams together. The objective scintigraphic density ratios were found to be significantly different between diseased and control horses. The results of this study suggest, that if a density ratio of 1.5 or greater between a suspected diseased tooth and its contralateral number is regarded as abnormal, only 1 % false positive diagnoses and 20 % false negative diagnoses will occur.

In contrast, scintigraphy with $^{99m}$Tc-labelled leucocytes was not very successful, due to the lack of anatomical detail provided by this technique, which made identification of the diseased tooth impossible.

Conclusions: Accurate radiographic interpretation of dental disease presents difficulties, both in terms of missed diagnoses and mistaken diagnoses. Scintigraphy complements radiographic examination of dental structures by providing information important for accurate diagnosis and therefore essential for selection of the appropriate treatment for dental disease.
NUCLEAR SCINTIGRAPHY WITH $^{99m}$TC-HMPAO LABELLED LEUCOCYTES IN THE ASSESSMENT OF HORSES WITH MALABSORPTION

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Objectives: The objectives of this study were to assess the diagnostic and prognostic value of nuclear scintigraphy with $^{99m}$Tc-HMPAO labelled leucocytes in horses with malabsorption and whether or not this technique enables an identification of the anatomical distribution of gastrointestinal pathology and the identification of specific forms of malabsorption.

Methods: This prospective study comprised 15 horses with malabsorption as assessed by a oral glucose tolerance test (OGTT) with an increase in glucose levels <85% as the inclusion criterion. Abdominal scintigrams of horses which underwent scintigraphy for the assessment of dental problems in a separate study, not discussed in this presentation, were used as controls. In addition to the OGTT standard serum biochemical and haematological tests, a rectal biopsy was performed and examined histologically in each horse. Intraoperative or post-mortem biopsies of the intestinal wall were examined if possible. The leucocyte labelling was performed according to a standard protocol, provided by Nycomed Amersham International PLC, UK. The scintigraphic examination comprised a standard series of 12 images over the abdomen and was obtained one and three hours after reinjection of the radiolabelled leucocytes. In 6 horses another series was obtained 24 hours after injection. The images were acquired in a 256x256 matrix for 200,000 counts.

Results: In the control horses a high activity was seen over the lung, a moderate activity over the liver and spleen and a mild activity over the kidneys and bladder. There was also an activity over the ribs, which was high in very young horses and very faint in older horses. No uptake was seen over the intestines in control horses. In horses with malabsorption no intestinal uptake was seen in five horses: Two horses with postinflammatory fibrosis of the intestinal wall, two horses with malabsorption of unknown origin and in the horse with systemic granulomatous disease with mild gut involvement. A focal and linear increase in uptake in the area of the colon was seen in three horses: Two horses with eosinophilic and one horses with lymphocytic-plasmacytic enteritis. Linear increase in uptake over the site of the small intestine was seen in three horses: One horse with lymphocytic-plasmacytic enteritis, one horse with eosinophilic enteritis and one horse with malabsorption of unknown aetiology. Linear increase at the site of the colon alone was seen in two horses with lymphocytic-plasmacytic enterocolitis. Linear increase at the site of the small and the large intestine was seen in one horse with eosinophilic enterocolitis and one horse with malabsorption of unknown origin.

Conclusion: Since no intestinal uptake was seen one hour after injection in normal horses, but in 75% of the horses with definite diagnosis of intestinal disease, intestinal activity at this time seems to be highly suggestive of disease. Corresponding to the findings in humans this technique can differentiate active from chronic disease. It is able to identify the site of disease and can assess large intestinal involvement, unlike OGTT. It was not possible to identify the character of the inflammation on the basis of the scintigraphic examination. In this study scintigraphy was not able to predict prognosis or response to therapy. However, the limitations of this study lay in the small numbers of horses and that it was not possible to get a specific diagnosis in all of them. Nevertheless this technique seems to be a promising method for the assessment of horses with weightloss and chronic colic, which can complement the standard work up.
GASTRIC EMPTYING IN CATS USING DIETS VARYING IN FIBER CONTENT AND KIBBLE SHAPES.

Introduction
Nuclear scintigraphy to assess gastric emptying in animals has proven to be an accurate technique, which has the benefits of being non-invasive, physiologic, quantitative, and easily repeatable. Gastric emptying is influenced by many variables including meal size, water intake, caloric density, nutrient composition, particle size, and health status. It has been shown in cats that water intake, meal size, and diet type (canned versus dry) significantly influence gastric emptying in cats. The purpose of this study was to identify the influence of kibble shape and fiber content on gastric emptying in healthy cats.

Materials and Methods
Eight cats were randomly assigned to 4 groups of 2 each. Each group was fed one of four dry extruded test diets. These consisted of two with similar kibble shape and size, with variation in fiber content (high versus low), and 2 with similar fiber content, but variation in kibble shape and size (small round versus large triangle). Diets were radiolabeled with 118-148 Mbq (3-4 mCi) of $^{99m}$Tc-mebrofenin. Scintigraphic images were obtained for 20 seconds with the cats in right, left, and ventral recumbency. Scans were obtained at times 0 (immediately after the 10-minute test meal), 20, 40, and 60 minutes, then every 30 minutes to 6 hours. Gastric emptying studies were performed three times for each cat on each diet.

Gastric regions of interest were recorded and decay-corrected geometric means were calculated, with gastric activity on the time-0 image being 100%. The percentage of retained gastric activity (PRGA) data for each cat on each day were fitted into a non-linear model. The time points when 90, 50, and 20% of the test meal remained in the stomach ($T_{90}$, $T_{50}$, and $T_{20}$ respectively) were derived from these models. Water intake and meal sizes were considered covariates and were evaluated in low, middle, and upper quartiles.

Results:
The diets round in shape took significantly ($p< 0.05$) longer to reach $T_{90}$ compared to diets triangle in shape. Shape also influenced $T_{50}$ and $T_{20}$, with triangle shape diets taking significantly ($P< 0.05$) longer to reach $T_{50}$ and $T_{20}$. In cats fed high fiber diet, increased intake resulted in a longer time to $T_{20}$.

Discussion:
The shape (or surface area) of the kibble significantly influenced gastric emptying in cats in this study. Fiber content was most important at the later stages of emptying ($T_{20}$).
USE OF $^{99m}$Tc-FOLATE SCINTIGRAPHY FOR IMMUNE MEDIATED ARTHROPATHY

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Introduction: Many types of human cancer cells overexpress folic acid receptors. Novel experiments have shown that radiolabeled folate ($^{111}$In or $^{99m}$Tc) accumulates in these tumors. (1) At the same time, increased uptake has been observed in the synovial joints of persons with concurrent arthritis. It also was demonstrated that in vitro synovial macrophages of human patients with rheumatoid arthritis (RA) had an increased expression of folate receptors. (2) We hypothesize that $^{99m}$Tc-folate accumulates in arthritic synovial joints secondary to macrophage activation. To test our hypothesis, we studied $^{99m}$Tc-folate uptake in a standard rheumatoid arthritis model in the rat.

Materials and Methods: The institution’s animal care and use committee approved all procedures. Rheumatoid arthritis was induced in 26 female Lewis rats by administering an adjuvant, Mycobacterium butyricum, intradermally. The rats were fed a folate deficient diet prior to the experiment. Twenty-one days following induction, 500 $\mu$Ci of $^{99m}$Tc-folate were injected intraperitoneally. Scintigraphy was performed, obtaining whole body and extremity acquisitions of each rat. Two rats served as non-arthritic controls and were also given $^{99m}$Tc-folate. Two additional control groups were used to confirm that uptake of the radiopharmaceutical was folate-mediated. One group of arthritic rats received $^{99m}$Tc-folate plus free folate and the other received $^{99m}$Tc-pertechnetate.

Results: All rats that received the adjuvant developed clinical, radiographic and histologic signs typical of RA. Uptake of $^{99m}$Tc-folate was intense in the synovial joints of the extremities in all rats with RA. Uptake was also increased in the liver, spleen and kidneys. In the non-arthritic control rats, increased uptake was seen in the kidneys only. No uptake was seen in the non-arthritic control groups. Uptake was minimal in the arthritic rats that were given $^{99m}$Tc-folate plus free folate and those given $^{99m}$Tc-pertechnetate.

Discussion: Increased uptake by arthritic synovial joints is consistent with intracellular accumulation of folate-bound radiopharmaceutical. The uptake presumably involves “M” synoviocytes that are activated when arthropathy develops (3). Activated synoviocytes have an increased number of folate receptors on their cell membranes. Therefore, folate-tagged-drugs might provide a targeted method of drug delivery for immune mediated arthropathy. Scintigraphy with $^{99m}$Tc-folate was also performed in a dog with a history of immune mediated arthropathy. Intense uptake was seen in the synovial joints of the extremities, comparable to that of the rat model. $^{99m}$Tc-folate scintigraphy may be useful for identifying immune mediated and possibly, other forms of synovial inflammation in the dog. Early stages of osteoarthritis likely involve activation of “M” synoviocytes; thus $^{99m}$Tc folate scintigraphy might possibly identify osteoarthritis prior to its detection with radiology or MR imaging.

SIMPLIFIED METHODS FOR ESTIMATION OF $^{99m}$Tc-PENTETATE AND $^{131}$I-ORTHOIODOHIPPURATE (OIH) PLASMA CLEARANCE IN DOGS AND CATS

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Introduction: The purpose of this study was to evaluate simplified methods for estimation of $^{99m}$Tc-Pentetate and $^{131}$I-orthoiodohippurate (OIH) plasma clearance in dogs and cats using 1 and 2 blood samples.

Methods: Plasma clearances were calculated after a bolus injection of 1.85 to 11.1 MBq of $^{99m}$Tc-Pentetate and $^{131}$I-OIH using a 2-compartment model based on a 12-point curve as a reference method in 21 dogs and 18 cats. Three 2-sample and 3 single sample methods were investigated. The method yielding the smallest standard deviation of the difference (SDD) between the reference method and the simplified method was selected as the optimal one. Linear regression analysis was performed between the reference method and the simplified method and $R^2$ was calculated.

Results: For $^{99m}$Tc-Pentetate plasma clearance, the best 2-sample method was the one using a monocompartment model with samples taken at specific times. For $^{131}$I-OIH plasma clearance, the estimation was improved slightly by raising the clearance calculated using a monocompartment model by a parameter empirically determined. The best single sample method was the one using a linear quadratic regression between the volume of distribution of the tracer at a specific time and the clearance calculated with 12 samples.

Conclusion: $^{99m}$Tc-Pentetate and $^{131}$I-OIH plasma clearances can be estimated in dogs and cats with 1 or 2 blood samples with a reasonable margin of error compared to plasma clearances calculated using a 2 compartment model and 12 blood samples.

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Introduction:
Lymphoid hyperplasia (LH), also known as, nodular hyperplasia, reticuloendothelial hyperplasia, and follicular hyperplasia is a benign lesion observed in canine spleens often in response to chronic inflammation or an immune-mediated process. One study reported that LH was the most common histological finding in 1372 canine spleen samples examined. No prior study has described the sonographic findings in dogs with histologically confirmed splenic LH. The purpose of this presentation is to characterize the sonographic changes observed with LH in the canine spleen.

Methods:
The medical records from 1980 to 2000 were reviewed to identify dogs with histopathologic diagnosis (from surgery or necropsy) of splenic LH uncomplicated by concurrent splenic disease and prior sonographic examination of the spleen. The investigators reviewed the ultrasound images independently and then agreement was established on any discordant interpretations. In addition to signalment, the following ultrasound findings were recorded: nodule size, homogeneity, echogenicity, margins, and involvement of the capsule.

Results:
Thirty-one dogs, 4 of which had 2 nodules (35 nodules), were included in the study. The age ranged from 5 to 15 years with a mean of 10.2 year and a median of 11 years. There were 19 females (16 of which were spayed) and 12 male (6 of which were neutered). The weights ranged from 6.1 to 175 pounds with a mean of 56.6 pounds. A majority of the dogs were medium to large breed dogs. On ultrasound, the nodules observed were round nodules with smooth well-defined margins. Capsule rupture was not observed. The size of the nodules ranged from 1 to 13 cm with a mean of 4.6 cm. Only one nodule (3%) was generally hyperechoic to the spleen and was 4.5 cm in size. Twenty-six of the 35 nodules (74%) were generally hypoechoic to the spleen and had a mean size of 3.6 cm. Eight of the 35 nodules (23%) were complex, having the full spectrum of echogenicities, and had a mean size of 7.75 cm. On histopathology, 11 of the 31 cases (35.5%) had hematomas associated with the LH. Six of the 26 hypoechoic nodules (23%) had concurrent hematomas with a mean size of 6.8 cm. Five of the 8 complex nodules (62.5%) had hematomas with a mean size of 8.6 cm.

Conclusions:
The findings indicate that a majority of canine splenic LH nodules are round, smoothly marginated and generally hypoechoic to spleen tissue. The presence of hematomas in 35.5% of the LH nodules was similar to previous reports (29%). The presence of hematomas can result in increased size and complexity of echogenicity of the LH nodules in the spleen. Sonographic characteristics may aid in prioritizing a differential list for splenic nodules, but because there is some overlap between features of splenic LH and prior reports of splenic hemangiosarcoma and hematoma, histology is still needed for a final diagnosis of any splenic nodule found on ultrasound.
SONOGRAPHIC FEATURES OF DRUG-INDUCED SPLENIC CONGESTION


Purpose:

The administration of certain drugs is reported to result in splenic enlargement due to physiologic congestion. The goals of this project were to induce passive splenic congestion and measure the associated size, attenuation and backscatter changes.

Method:

Splenic congestion was induced by injection of 6 hound-mix dogs (10 Kg) with acepromazine (0.1 mg/Kg subcutaneous) followed in 30 minutes by thiopenthal (5-10 mg/Kg intravenous). Imaging was performed 15 minutes following each injection with a GE Logic 700 machine and 7 MHz linear transducer. All machine settings were standardized and data evaluated using the video signal analysis (VSA) method. Spleen thickness was measured at three sites along the splenic hilus at regions of major splenic veins. Three transverse plane images were acquired at each site. A one-way ANOVA was used to test for statistical significance.

Results:

The spleen subjectively was increased in size but echogenicity unchanged after administration of acepromazine. There was no statistical change in backscatter during the study. A significant decrease in attenuation was measured after acepromazine administration (p=0.01) which persisted after thiopenthal injection (p=0.05). Thickness of the spleen increased significantly after acepromazine administration (p=0.01) which significantly progressed after thiopenthal injection (p=0.01).

Discussion:

The dog is a good model for passive splenic congestion. While subjectively and objectively no change in the scattering (=echogenicity) was noted, acepromazine administration caused significantly increased size and decreased splenic attenuation. These results need be accounted for during sonography of sedated or anesthetized patients. The results of thiopenthal administration may have been effected by persistence or the concurrent effects of acepromazine. The effects of varying dosages was not studied.
EVALUATING POWER DOPPLER ULTRASOUND AS A METHOD FOR CLINICAL MONITORING OF TUMOR ANTIANGIOGENIC THERAPY

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Purpose: To monitor murine tumors undergoing antiangiogenic therapy by serial Doppler ultrasound imaging and to correlate imaging data with biological measurements of tumor vascularity.

Methods: K1735 murine melanomas were established subcutaneously and treated with angiogenesis inhibitor IL-12 for a period up to three weeks. Also included were K1735.N23 tumors derived from a K1735 variant resistant to IL-12 therapy. Tumors were imaged weekly using a L10-5 MHz transducer and commercial ultrasound unit (ATL Ultramark 9 HDI). ROIs on the digitized power Doppler images of the entire tumor volume were analyzed for mean color level (MCL), fractional area (FA) and color-weighted fractional area (CWFA). After therapy, tumors were excised, sectioned and analyzed histologically for microvessel density and size distribution. Size-matched treated and untreated tumors were examined for functional vascularity in three dimensions by fluorescent lectin perfusion and laser scanning confocal microscopy. Pre- and post-treatment tumor oxygenation measurements were obtained by Eppendorf needle electrode sampling. Results in K1735 tumors were confirmed in two other mouse tumor models.

Results: K1735 tumor (but not N23) growth was suppressed by IL-12 treatment compared to the untreated controls. Serial power Doppler images of K1735 tumor vascularity during treatment revealed a progressive change from a diffuse vessel network to a punctate distribution of several large vessels. CWFA consistently decreased 40 - 80% in tumors compared to their pre-treatment values, primarily due to a decrease in FA. Therapeutically-unresponsive N23 tumors exhibited increased CWFA levels over time. Confocal analysis revealed a decrease in perfused vessel density with effective treatment due to a drop in vessel arborization. Histological examination of tumor vessels confirmed the selective loss of small vessel branches with therapy. Therapy-induced tumor ischemia was manifest as decreased tumor oxygenation by Eppendorf histology. Progressive decreases in tumor perfusion were observed during IL-12 treatment of two other murine tumors associated with tumor growth suppression.

Conclusions: Antiangiogenic therapy of subcutaneously-implanted tumors resulted in observable changes in power Doppler images; the treatment-induced decrease in CWFA and FA were correlated with decreased vessel arborization and density, and decreased tumor oxygenation. These results support using power Doppler ultrasound as a sensitive and specific method for non-invasive assessment of clinical efficacy of antiangiogenic therapy.
QUANTITATING ATTENUATION AND BACKSCATTER CHANGES IN LIVER WITH CONTRAST AGENT.

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Purpose:
The administration of an ultrasound contrast agent results in time-dependent elevations both in echogenicity and acoustic attenuation in an organ. The purpose of this work is to quantify these acoustic changes, using video signal analysis (VSA), following bolus injections of ultrasound contrast agent.

Method:
Optison (1 ml) was injected intravenously into three dogs (8 kg). A GE Logiq700 scanner operating at a 1/3 s\(^{-1}\) frame rate was used to image the liver for a period of up to 1-minute following injection. For this phase of the study, only fundamental mode images were acquired using a 2.5 MHz frequency setting and 3 different transmit levels on the probe. Images were also acquired from a reference phantom with known attenuation and backscatter. A gray scale look-up table derived experimentally for the scanner-signal processing settings allowed "mean pixel values" versus depth for the liver images to be converted into decibels relative to mean pixel values from the reference phantom. The slope of this line quantitates absolutely the attenuation, while the zero depth intercept yields the changes in backscatter resulting from the contrast agent.

Results:
The administration of 1 ml of agent produced a barely perceptible change in image brightness for the settings applied in this study. Subjectively mild increased attenuation was noticed. However, the attenuation and backscatter values derived through VSA were notably increased after contrast injection.

Discussion:
Not all experimental trials resulted in significant changes in acoustic properties. This may be due to the frame rate, transmit power, focal distance, or the scan plane utilized on the subject. VSA is useful for quantifying attenuation and backscatter changes with contrast agent administration. Future studies will address reasons for differences in acoustic changes among dogs, while better characterizing acoustic output and extending VSA to harmonic echo signals.
Introduction/Purpose:
Autosomal dominant polycystic kidney disease (ADPKD) is a common genetic disorder in humans. It is recognized in veterinary medicine in Persian and related cats. The most important manifestation of this disease is renal failure. As the disease advances, cysts increase in number and size, and renal volume increases. The purpose of this study was to fully describe the ultrasonographic and computed tomographic appearance of ADPKD in cat kidneys; to estimate total renal volume and cyst volume; and to determine renal function as estimated by glomerular filtration rate.

Methods:
A total of 10 cats (5 ADPKD, 5 normal) were studied with approval of the Ohio State University Institutional Laboratory Animal Care and Use Committee. Renal volume was estimated with 2 imaging modalities, ultrasound (US) and computed tomography (CT). Cyst volume was calculated with CT. Glomerular filtration rate (GFR) was determined by two nuclear scintigraphic methods: $^{99m}$Tc-diethylene-triaminepentaacetic acid ($^{99m}$Tc-DTPA) scintigraphic uptake, and $^{99m}$Tc-DTPA plasma clearance.

Results:
Ultrasonography of ADPKD affected kidneys demonstrated multiple anechoic to hypoechoic round to irregularly shaped structures, most of which were detected in the cortex of the kidneys but also involved the medullary areas. Affected kidneys had diminished corticomedullary junctions and foci of mineralization. CT of affected cats showed foci of mineralization and areas of mildly decreased density before administration of IV contrast. IV contrast allowed easier identification of cysts and demonstrated compression of renal pelves by cysts.

The US-derived renal volume for normal cats was 14.8 +/- 2.9 mm$^3$ and for ADPKD cats was 27.4 +/- 10.3 mm$^3$. A significant difference (Welch ANOVA, p=0.050) was detected between the US-estimated renal volumes of normal and ADPKD affected cats. No differences between normal and ADPKD affected cats were detected in CT kidney volume, $^{99m}$Tc-DTPA scintigraphic uptake or $^{99m}$Tc-DTPA plasma clearance GFR. In this group of ADPKD cats, renal function was within normal limits.

Discussion/Conclusion:
This study demonstrates the value of US and CT in the diagnosis of ADPKD. The lack of statistical differences between GFR of the normal and affected groups may be explained by the relatively small percentage of renal volume being affected with cysts, small subject number, and the tendency for renal failure to develop later in life. ADPKD affected cats may live well into late age before onset of renal failure.
ULTRASONOGRAPHIC ANATOMY
OF THE EQUINE TEMPOROMANDIBULAR JOINT

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Purpose – Description of the normal ultrasonographic anatomy of the temporomandibular joint (TMJ) by comparison with gross anatomical preparations, and the application of the technique to clinical cases.

Methods – Forty TMJ, in 10 cadaver heads and 10 live horses without any known history or signs of TMJ disease, were examined ultrasonographically, using a variety of transducers and different projections. All isolated heads were eventually dissected. Transverse sections were obtained from the TMJ of three frozen heads. Three different planes were chosen to correspond as closely as possible to the ultrasonographic projections.

The TMJs of one horse with a remarked swelling over the left TMJ and two headshakers were examined clinically, radiographically, scintigraphically and ultrasonographically. The diagnoses in these horses were confirmed by postmortem examination as septic arthritis, acute non-septic arthritis and bilateral degenerative joint disease.

Results – A 7.5 MHz linear array transducer was thought to provide the most useful pictures. A minimum of three transverse views would seem to be necessary to provide a complete examination. The surfaces of the bones were easily identified as smooth hyperechoic lines in sound horses. In horses with TMJ disease, new bone formation could be seen. The intraarticular disc appeared ultrasonographically as a triangular structure with its base laterally, attached to the joint capsule, and apex pointing medially. In the horse with septic arthritis, the disk was not visible, but replaced by fibrous tissue with hyperechoic calcification interspersed. The joint capsule was visible as an interface between the disc and overlying tissues. It appeared to be thickened in the horse with degenerative joint disease. The articular cartilage could be identified but its thickness varied with the age of the horse. Ultrasonographically, there was no evidence of articular fluid in sound horses, but increased fluid was present in the horse with non-septic TMJ arthritis.

Conclusion – Ultrasonography of the TMJ is easily performed in the standing horse with standard equipment. No significant anatomical variations were identified in sound horses and, therefore, in the opinion of the authors, changes in the ultrasonographic appearance are highly suggestive of pathological lesions. The technique described should provide useful information about a region in the horse, where disease processes occur, which is difficult to assess.
A SURVEY OF VETERINARY RADIOGRAPHY STANDARDS

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Introduction/Purpose: To define the types and incidence of technical radiographic problems in veterinary practice in order that specific recommendations be made to the veterinary profession.

Methods: All radiographs received by a mail-in radiology service were assessed over a five month period. Each case was identified according to the veterinary practice, veterinarian, species, type of examination, number of films and type of processing (manual or automatic). All cases were assessed by ACVR Boarded Radiologist (RGN or GSA) for overall radiographic quality (diagnostic / compromised/ non-diagnostic), as well as veterinarian (operator) dependent factors and equipment dependent factors influencing radiographic quality. Additionally, assessment of occupational health and safety factors was made.

Results: Of the 671 small animal radiographic examinations received, the following problems were found:

- overall quality: 35% diagnostically compromised (1% non-diagnostic)
- views: 33% incomplete (2% non-diagnostic)
- positioning: 25% inadequate (0.15% non-diagnostic)
- contrast: 42% inappropriate (21% insufficient; 21% excessive)
- density: 43% inappropriate (20% insufficient; 23% excessive)
- grid problems: 27% (23% not used when required; 3% cut-off; 1% damaged)
- screen problems: 16% (14% dirty screens; 2% damaged)
- film problems: 10% (9% damaged or scratched emulsion; 1% static electricity)
- film fog: 5% (4% focal fog; 1% diffuse fog)
- labelling: 43% inappropriate (25% inadequate information; 18% applied label)
- darkroom artifacts: 21% (14% splashes; 4% fingerprints; 2% machine; 1% mixing)
- developing: 21% (17% tired developer - manual >> automatic processing)
- fixing: 1% inadequately fixed (manual processing only)
- washing: 5% inadequately washed (7% manual processing; 2% automatic processing)
- safety: 10% unacceptable (8% protection garments; 2% unprotected human)
- collimation: 90% unacceptable (48% no collimation; 42% incomplete collimation)

Discussion/Conclusions: Significant technical and radiation safety practice problems exist in the sample of referring veterinary hospitals in Australia. These problems represent all facets of the production of radiographs - operator factors (positioning and views; technique selection; labelling; processing), equipment factors, and radiation safety practices. From both diagnostic and occupational health and safety perspectives, there is a requirement for radiographic standards to be improved in Australian veterinary practices. This necessitates the education of veterinary hospital personnel involved in the production of radiographic examinations as well as equipment upgrades such that appropriate examinations are possible.
TEACHING VETERINARY RADIOGRAPHY VIA THE INTERNET.

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Introduction: Veterinary radiologists are in high demand, especially in academia. Many veterinary schools have at least one vacancy in their radiology section creating increased teaching workload. Internet technology continues to advance at a rapid pace with the transfer of still and video images being common. Lectures presented via the internet are possible allowing the teacher to be in a different location from the class.

Methods: Dr. GA Henry presented 10 abdominal radiography lectures to third year veterinary students at Oklahoma State University from his office at Texas A&M University via an internet connection. PowerPoint slides (word and radiographic images) and a live video image with audio of Dr. Henry were transmitted simultaneously. Video and audio from the classroom was transmitted to Dr. Henry’s computer. All media were presented as a Microsoft NetMeeting conference. A survey was presented to the students following the semester for their feedback on the internet lectures.

Results: Abdominal radiography course material was successfully delivered via the internet. Ten of 75 students (13.3%) returned the survey. None of the respondents previously attended an internet class. The internet graphics were excellent to good, no different than the traditional lectures. The ease of communicating with the professor was fair to poor, worse than the traditional lectures. Seven students thought the internet lectures were worse than traditional lectures while 2 students thought the internet lectures were better. Nine students performed the same or better on the examination following the internet lectures. Six students would take an internet class again. Interruptions in internet transmission were the major weakness of the internet lectures. Strengths of the internet lectures included the quality of instructor and the ability to bring experts to class.

Discussion/Conclusion: Teaching veterinary radiology via the internet is a feasible method for delivering information to remote locations. Internet teaching may be advantageous to understaffed faculty or as a method to provide lectures from experts without the lecturer having to travel. The internet transmission glitches stole valuable time from a fixed 50-minute lecture causing student dissatisfaction. Transmission glitches might not be as detrimental to lectures without specific time constraints. As technology advances, it may be easier to develop interactions between the internet lecturer and class similar to an in-person situation. From an instructor’s point of view, lecturing to a computer does not have the same feel as lecturing to a class. Given the shortage of academic radiologists, internet teaching is a feasible option to ease teaching load.
Digital Photography: A Guide for the Veterinary Radiologist

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Saskatoon SK S7N 5B4

Digital Advantages. Digital cameras enable you to view your pictures almost immediately on the built-in LCD display. If unsatisfactory, the picture can then be repeated. Digital images can be readily transferred to a desktop or portable computer for use in classroom lectures, clinical conferences and meetings. Digital images can also be sent to colleagues as e-mail attachments, archived on professional web sites, and submitted, along with manuscripts, for publication in books and scientific articles.

How Digicams Work. Digicams work in many respects like traditional film cameras: a lens focuses light through an adjustable opening for a specific amount of time on a recording medium (film). Where a digicam differs most from a conventional camera, is in its method of image recording, where film is replaced by a digital storage devise, such as a flash memory card.

Low Light Photography. Due to the relatively reduced light passing through many illuminated medical images, especially thoracic radiographs, it is advisable to purchase a digicam with low light capability (F2 lens, ASA 400).

Macrophotography. For close-ups of anatomic and pathologic specimens, it is highly desirable to be able to get within one or two inches of the subject. For most multiformated images and many detail views it is usually necessary to approach within at least eight inches of the film.

Telephotography. An optical zoom of at least 3X is needed for most unobtrusive shots of people and animals. 10X (or better) is often required for zoo and wildlife work. A telephoto capability is also very useful for photographing radiographs, allowing the photographer to compose his or her picture without having to move the camera toward or away from the film.

Movies. While not a necessity (and certainly not of camcorder quality) many digicams are capable of recording brief, low quality videos, which can be useful in creating echocardiographic clips, demonstrating special procedures, and portraying lameness or incoordination.

Image Recording. Most digicams record pictures and video digitally on removable electronic media such as CompactFlash or SmartMedia cards, Memory Sticks (Sony) and miniature hard drives (IBM Microdrive). Sony has recently introduced a digital camera (MVC-CD1000) which records its images on 3-inch compact discs. Polaroid and Olympus have announced a digital camera (C-211 Zoom Digital Printing Camera) that will take and develop its own prints.

Powering Your Camera. Exhaustive power demands make at least two sets of rechargeable batteries and a charger mandatory. An AC adapter is ideal for medium and large indoor jobs.

Image Transfer & Modification. USB connection is a must. A USB flash card reader avoids tying up your camera while you upload, and saves your batteries if you don’t have an adapter. Each company has its own proprietary image-retouching software, some good, some bad. Get PhotoShop! Tip: The difference between good and great pictures is a tripod. Good luck. C.S.F.
CT ANGIOGRAPHY: RENAL VASCULAR IMAGING OF THE POTENTIAL FELINE RENAL DONOR

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Introduction: Pre-operative knowledge of the renal vascular anatomy is required for selection of the appropriate feline renal donor. Intravenous urograms (IVU) have been routinely performed to screen potential donors at the Veterinary Hospital of the University of Pennsylvania (VHUP), but vascular phase radiographs lack sufficient detail of the renal vascular anatomy. Computed tomography angiography (CTA), which requires a helical CT scanner, has been found to provide superior renal vascular anatomic information of prospective human renal donors. The purposes of this study were: 1.) develop the CTA technique for the feline patient and 2.) determine the utility of CTA for donor selection.

Methods: Ten normal feline, potential renal donors were anesthetized and imaged on a General Electric ProSpeed helical CT scanner. Pre-contrast series of helical axial images were obtained of all cats. Time-density curves were generated in the first 5 cats by utilizing a cine function (20 serial 1 second axial acquisitions at a predetermined location with no patient translation and no interscan delay) immediately following an IV (cephalic vein) test bolus of iodinated contrast agent (0.22ml/kg, Iohexol 240). The aortic origin of the cranial mesenteric artery seen on the pre-contrast series was chosen as the fixed location; the time-density curve ROI was positioned on the aorta. In all cats, the time-density curve information was used to optimize delay of CTA image acquisition following IV bolus injection of contrast agent (2.2ml/kg, Iohexol 240). Acquisition parameters of slice thickness, slice interval, helical pitch, exposure settings, and reconstruction algorithms were varied to optimize enhancement of the renal vascular anatomic detail. Retrospective reconstructed (retrorecon) CTA axial images and 3-dimensional reconstructed images were qualitatively evaluated for vascular anatomy. Renal vascular anatomy was confirmed at surgery.

Results: Optimal CTA acquisition parameters were: ten second scan delay post-contrast agent bolus; two serially-acquired (one arterial, one venous phase) helical scans of the renal vasculature at a pitch of 2 (4mm/sec patient translation, 2mm slice width); 120 kVp, 160 ma, 1 second exposure settings. Retrorecon axial images were obtained at a 2 mm slice width and 1 mm slice interval using reconstruction algorithms with and without post-processing edge enhancement. Accurate assessment of the renal vascular anatomy was determined on the retrorecon CTA axial images in nine cats. Three-dimension reconstruction was necessary to determine the presence of a double renal vein in one cat. Normal renal vasculature on CTA was seen in four cats with surgical confirmation occurring in three cats; the fourth cat has not yet been used as a donor. CTA identified renal vascular anomalies in five of the remaining six cats which were confirmed at surgery; the sixth cat was withdrawn from the donor program for unrelated medical problems.

Conclusion: CTA of the feline renal vasculature is feasible and reconstruction techniques provide excellent anatomic vascular detail. CTA is useful for feline renal donor screening; pre-operative knowledge of renal vasculature decreases surgery time at organ harvest and transplantation. CTA is now routinely used to screen potential feline renal donors at VHUP. Future CTA applications include adaptation for the canine patient, investigation of suspected thrombi, and other extra-renal abnormal vascular anatomy (e.g. portosystemic shunts).

This work was supported a Research Grant from the Department of Clinical Studies – Phila.
CT ANATOMY OF THE EQUINE HEAD.


Purpose:
The use of computed tomography (CT), as an adjunct to conventional radiology, is increasing in equine medicine and surgery. The purpose of this paper is to produce a user-friendly anatomical atlas describing the normal CT anatomy of the equine head and to identify the CT scanning parameters that produce consistently images of diagnostic quality. Previous published reports have shown the effectiveness of computed tomography in diagnosing abnormalities in the equine lower limb. In the skull region, CT imaging has been successfully used for evaluating pathology of the central nervous system, dental arcade, paranasal sinus, orbital region, and adjacent soft tissue structures. However, introductory knowledge of CT normal anatomy and selected diseases of the equine skull can only be found scattered in the available literature.

Methods and Materials:
One healthy live Standardbred with a normal anatomical head and physical exam was anesthetized and scanned in dorsal recumbancy. 10mm thick transverse images with 1cm inter-spacing, starting at the level of the nasal planum and extending caudally to the level of the occipital condyles were taken. Pre and post contrast examinations were performed. In addition, three normal heads from euthanized animals were also scanned following the parameters described above. The images were obtained using a Helical CT Picker 5000 unit and a third generation Shimadzu CT scanner. Images were stored on optical disk. 3D and 4D reconstructions of the stored images were also generated. Anatomical correlation between the images and gross specimens were made by obtaining 10mm thick gross cross-sectional slices of the normal heads of the euthanized animals.

Results:
The optimal scanning parameters were as follows:
Brain (bone window): 120 kV, 300mAs, level 300, width 3500
Brain (soft tissue window): 120 kV, 300 mAs, level 60, width 300
Nasal sinuses (bone window): 120 kV, 300 mAs, level 300, width 1500
Nasal sinuses (soft tissue window): 120kV, 300 mAs, level 35, width 300

Conclusions:
As expected, a single scanning parameter protocol cannot be used to assess all the different areas of the horse's head. The authors have found that to preserve anatomical symmetry dorsal recumbency is the preferred positioning. The main advantage of computed tomography in equine medicine, is the ability to produce detailed cross sectional anatomical studies, without superimposition of structures. In addition, there is increased soft tissue contrast resolution and the ability to produce reconstructed images in various planes. Disadvantages of equine computed tomography include the cost of equipment and facilities, anesthesia time, and limitations associated with the CT unit gantry size. An overview of the general CT anatomy with emphasis in the major anatomical landmarks will be given during the presentation.
CORRELATION OF LUMBOSACRAL COMPRESSION ON MRI WITH CLINICAL SIGNS IN DOGS WITH DEGENERATIVE LUMBOSACRAL STENOSIS.

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Introduction: Degenerative lumbosacral stenosis (DLSS) is a well-recognized condition in dogs associated with clinical signs referable to compression of the cauda equina. It is most commonly caused by a Hansen type II fibroid disc degeneration leading to bulging of the disc and compression of neural structures. The clinical picture is variable, with some dogs presenting with only lumbosacral pain and some dogs having varying degrees of neurological deficits such as weakness/paresis, urinary or fecal incontinence and dysesthesias. It is the purpose of this study to correlate the degree of compression of the neural structures of the lumbosacral space seen on an MRI with the severity of clinical signs shown by the patient.

Methods: The medical records of 29 dogs with clinical signs consistent with lumbosacral disease were reviewed. Animals found to have a diagnosis other than DLSS were excluded. Each received a general physical as well as neurological examination. All dogs had their lumbosacral area imaged with a General Electric 1.5 Tesla superconducting magnet. Sagittal and axial T1 and T2 weighted images without suppression of the fat signal were obtained. Two indices of neural structure compression were calculated. Compression on the sagittal T2 weighted image was calculated by measuring the distance from the dorsal to ventral margins of the epidural fat at the L7-S1 disc space and dividing this value by the same measurement taken at the level of the mid body of the L6 vertebrae. Cross sectional area of the lumbosacral canal was measured on either T1 or T2 weighted axial images and again this value was similarly divided by the same value calculated at the level of L6. These two measurements give us two unitless indices (from 0 to 1) of compression which account for breed and size variation. The cases were then divided into three groups, based on the severity of their neurological deficits and the degree of their lumbosacral compression as assessed by the two measurements described. Measurements were compared to those of 3 unaffected dogs.

Results: Analysis of the degree of compression on the sagittal images suggests that there is only poor correlation between the severity of clinical findings and the severity of neural structure compression on the MRI. Analysis of cross sectional areas will be completed and presented.

Discussion/Conclusions: We found MRI to be a highly sensitive modality for examination of the neural structures, intervertebral discs, articular facets, vertebrae and associated soft tissue structures of the lumbosacral spine. However the imaging findings seem to be poor for predicting the clinical picture. I would suggest that there may be other factors, as yet unidentified that can make two animals with similar degrees of neural compression present clinically very differently. Most importantly, the diagnosis and the decision to carry out decompressive surgery of the area should never be made based solely on consideration of the imaging findings.
CONTRAST ENHANCEMENT OF COMPRESSIVE SOFT TISSUES IN THE CANINE LUMBOSACRAL SPINE: ANALYSIS USING CT DENSITOMETRY

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Introduction: Degenerative, inflammatory, neoplastic, or traumatic diseases may cause soft tissue stenosis of the canine lumbosacral spine. A noninvasive method for determining the cause(s) of soft tissue stenosis would be of benefit for studying pathophysiologic mechanisms, planning treatment, and assessing response to treatment in affected dogs. The objective of this prospective study was to determine whether the degree of CT contrast enhancement could be used to predict the type or histopathologic characteristics of compressive soft tissues in dogs with lumbosacral stenosis.

Methods: Contiguous, transverse CT slices of the L5-S3 vertebral levels were obtained pre- and post-contrast in 31 dogs. Post-contrast images were obtained within 20 minutes of a rapid intravenous bolus injection of iodinated contrast medium. A water-filled tuberculin syringe was placed parallel to the spine and included in at least 3 images per scan. For each scan and each disc space examined, elliptical regions of interest were placed within the water syringe, the epaxial muscles, and four vertebral canal locations (dorsal, ventral, right lateral, left lateral). A computer software package for densitometry was used to calculate mean CT density values (HU) for each region of interest. At surgery, compressive soft tissues were described by disc level and with-in level vertebral canal location. Tissue type categories were assigned based on gross appearance at surgery and results of routine histopathology. Degrees of histopathologic tissue activity and inflammation were measured using a linear scale. Corrected CT enhancement for each vertebral canal location was calculated using the formula: [(density post contrast - density pre contrast) - mean water syringe density change for dog]. Analysis of covariance, with mean muscle enhancement as a covariant, was used to assess the effect of compressive soft tissue type on corrected CT enhancement values. Corrected CT enhancement values were compared with degree of tissue activity and degree of tissue inflammation using correlation.

Results: Tissue type categories included: epidural fibrosis, herniated disc, hypertrophic ligamentum flavum, hypertrophic joint capsule, congested vein, swollen nerve root, neoplastic tissue, and inflammatory tissue. Contrast enhancement significantly increased CT density of the water syringes (p = 0.0005). Corrected CT enhancement of vertebral canal soft tissues at stenotic sites was significantly higher than at nonstenotic sites (p < 0.05). There was no significant association between corrected CT enhancement and the presence of any compressive soft tissue type (p > 0.05). No correlation was identified between corrected CT enhancement and degree of tissue inflammation for any of the vertebral locations. A significant correlation was identified between corrected CT enhancement and degree of tissue activity for dorsal canal locations (p = 0.0076).

Conclusion: Findings from this study indicate that 1) a water-filled tuberculin syringe is a useful calibration tool for outside factors such as x-ray beam energy variation and beam-hardening artifacts, 2) soft tissues at stenotic sites enhance more than at non-stenotic sites, 3) the degree of corrected contrast enhancement cannot be used to predict compressive tissue types or degree of tissue inflammation, and 5) the degree of contrast enhancement may be used to predict the degree of tissue activity in the dorsal vertebral canal.
MAGNETIC RESONANCE IMAGING OF EXTRADURAL SPINAL CORD MASSES – DISTINGUISHING CONTRAST ENHANCING DISC DISEASE FROM NEOPLASIA.

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Magnetic resonance (MR) imaging has been part of the evaluation in dogs presenting for suspected spine and vertebral column disease at WSU since 1996. Six dogs evaluated had contrast enhancing masses, later confirmed to be disk extrusions. This paper will discuss the MR features of contrast enhanced disc disease, and compare the findings to confirmed neoplastic disease.

Methods
All dogs evaluated for spinal and vertebral body disease were imaged in dorsal recumbency, using a quadrature spinal coil with a 1.0 T Philips MR scanner. Anesthesia was maintained with inhalant anesthetic. The MR examinations were initiated with T2-weighted images in a sagittal plane followed by T2-weighted images in transverse plane in areas of interest. These scans were followed by transverse T1-weighted images obtained before and after intravenous administration of Gadolinium in cases where neoplastic or inflammatory disease was suspected from the T2-weighted studies. Additional studies were preformed in selected cases.

Results
Dogs with contrast enhancing disc disease were small and medium breeds, and age at presentation ranged from 5 to 10 years. The chief presenting complaint was spine hyperesthesia. The duration of the clinical signs ranged from 2 to 36 weeks. The T2-weighted images revealed a loss of signal intensity of the nucleus pulposus, and a mass extending from the region of the intervertebral disk space and cranially. The masses had a heterogeneous signal predominantly hypo- and isointense to the spinal cord on the T2-weighted images, and they were hypo- and isointense to the cord on T1-weighted images. After administration of gadolinium the masses were noted to be peripherally enhancing.

Surgery was performed in each case to decompress the spinal cord and definitively diagnose the extradural mass. Histopathology results confirmed the masses as disk material. Post operatively all dogs returned to normal function, free of pain.

Discussion
A differentiation between neoplastic and non-neoplastic diseases on imaging studies has prognostic and therapeutic importance. Image results revealing an extradural mass should be examined for close spatial relation to the intervertebral disc, evidence of disc degeneration, peripheral contrast enhancement of the mass, and lack of vertebral bony invasion. These imaging characteristics can help differentiate contrast enhanced disc disease from neoplastic disease.
HELICAL AND INCREMENTAL HIGH-RESOLUTION THIN-SECTION PULMONARY COMPUTED TOMOGRAPHY– EVALUATION OF AN ACUTE INFLAMMATORY RESPONSE OF THE CANINE LUNG

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Introduction/Purpose: Helical and High-Resolution Thin-Section Computed Tomography (HRCT) are routinely used in people to complement radiography in assessing pulmonary disease. Quantitative studies of the human lung provide both subjective and objective data reflecting pulmonary abnormalities. The role of Computed Tomography (CT) in diagnosing thoracic disease has not been well described in veterinary medicine. The purpose of this study was to qualitatively and quantitatively characterize Helical CT and HRCT findings in a canine model of acute pulmonary inflammation and to compare these findings to those from a normal control group from a previous investigation.

Methods: Helical and HRCT scans of the thorax were obtained in six anesthetized normal adult Beagle dogs following physical and routine thoracic radiographic examination. Helical CT was performed with 4 mm collimation and a pitch of 1.5; incremental HRCT was performed at 2 mm collimation and increments of 4 mm. High-frequency and standard reconstruction algorithms were used to optimize evaluation of pulmonary parenchyma and non-pulmonary soft tissues, respectively. Dogs were maintained in full inspiration by hyperventilating prior to each scan, then maintaining airway pressure at 15 cm H$_2$O during image acquisition. The right middle and the caudal component of the left cranial lung lobes were then cannulated using endoscopic guidance, and fresh whole blood or dilute HCl were infused into each lobe. CT scans were repeated immediately following instillation and 24 hours later. Lungs were preserved in situ by tracheal infusion of 10% formalin at a constant infusion pressure immediately following euthanasia. Histomorphometric evaluation of pulmonary volume density, alveolar size (by mean linear intercept), and alveolar surface area (surface area to volume ratio) were estimated by point and intercept counting of histologic sections, using computer images superimposed on a test grid.

Results: Descriptive statistics were generated for total lung volume (cm$^3$) and mean lung density (HU). Analysis of histomorphometric data included volume density of parenchymal and non-parenchymal tissue (% of entire lung volume), alveolar size ($\mu$m) and alveolar surface area ($\mu^2$). All parameters were compared with those obtained from normal dogs.

Discussion/Conclusions: This preliminary study established a protocol for qualitative and quantitative evaluation of pulmonary parenchyma using Helical and HRCT imaging. It will also serve as the basis for future investigations to characterize diffuse parenchymal disease, airway oriented disease and solitary pulmonary nodules using the same technology.
HELICAL TOMOTHERAPY.

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Introduction: Helical tomotherapy is a novel intensity-modulated radiation therapy (IMRT) treatment modality. IMRT is a 3D conformal radiotherapy technique where treatment beams are spatially and temporally modulated to maximize dose to the tumor volume, while minimizing dose to normal structures. The tomotherapy system uses a dynamic binary multileaf collimator and a CT-like gantry. Helical tomotherapy is the integration of radiotherapy and helical computed tomography (HCT), where the patient is continuously translated through a ring gantry as the fan beam rotates around the patient. An advantage of helical tomotherapy over IMRT is the addition of verification set-up and adaptive radiotherapy capabilities. The megavoltage (MV) tomographic images are used for verification set-up of the treatment field and dose delivery. Dose reconstruction can be obtained from HCT detectors and variations in treatment can be accounted for and corrected during the course of treatment.

Purpose: The purpose of this study was to test the capabilities of a bench-top helical tomotherapy system using canine cadaver head phantoms.

Methods: Two canine cadaver heads were used in this study. Tubing for dosimetry was placed in or near the nasal and oral cavities. The cadaver phantoms were placed in custom-made polyurethane molds. A kilovoltage (KV) computed tomography scan was performed on each cadaver phantom and mold. Using radiotherapy treatment planning software a simulated nasal tumor was outlined along with contouring of critical normal structures and an optimized tomotherapy treatment plan calculated. Dosimeters were placed in the tubing and the treatment was delivered on the tomotherapy bench-top unit. The delivered dose was compared with planned and reconstructed dose maps. MV tomographic images were obtained.

Results: The MV tomographic images of the cadaver heads were of good quality and suitable for treatment positioning and dose verification. Dose reconstruction detected an error due to misalignment corresponding to the beginning of the rotation of the bench-top unit in the “treatment” of the first cadaver phantom. This error resulted in “over-treatment” of the left eye. Dose reconstruction of the “treatment” of the second cadaver phantom resulted in near perfect alignment of the planned dose volume histogram (DVH) with the measured DVH.

Discussion: Canine cadaver phantoms provide a more realistic apparatus to test novel treatment units prior to implementation into companion animal or human clinical trials. Helical tomotherapy provides the platform for megavoltage tomograms for accurate set-up verification and where necessary, adaptive dose modification. The treatment error detected in dose reconstruction of the first cadaver phantom “treatment” can be addressed with tomotherapy and corrected in the next fraction because delivered dose can be verified. The conformal treatment capabilities of helical tomotherapy has the potential to allow for both target dose escalation and improved avoidance of neighboring critical structures. The integrated imaging capabilities can provide a more accurate treatment delivery by virtue of accurate set-up verification and dose reconstruction.
RADIATION THERAPY UTILIZING MULTIPLE FIELDS WITH NONCOINCIDENT ISOCENTERS IN THE TREATMENT OF NASAL TUMORS IN DOGS.


Introduction: There has been little improvement in the survival of dogs treated with irradiation for nasal tumors. With surgery alone, survival time is less than six months. Radiation therapy alone has resulted in poor local control with significant side effects. Even with the advancement of CT-based treatment planning, local recurrence caudally has remained a problem. Obtaining a homogenous dose distribution, especially caudally, has been difficult with traditional radiation therapy utilizing large treatment fields with coincident isocenters. In this study we evaluate the effectiveness of using multiple fields with noncoincident isocenters to increase the radiation dose delivered to the ethmoid region, a region at risk for tumor recurrence. Using dose-volume histograms, we expect to demonstrate improved tumor dose distribution with the addition of a smaller caudal field having a different isocenter.

Methods: CT images from eight dogs with nasal tumors were obtained and used in CT-based computerized treatment planning. Gross tumor volume, target treatment volume and normal tissue structures were identified using a tissue contouring program. A traditional computerized treatment plan consisting of large parallel-opposed fields was constructed for each dog. A second treatment plan utilizing multiple fields with different isocenters was constructed for comparison. Dose-volume histograms were generated for each contoured structure in both plans. Comparison of the two plans was based on the dose-volume histograms. Results of this comparison will be available at the time of the meeting.
Gemcitabine as a Radiosensitizer for Canine Sinonasal Carcinoma and Feline Oral Squamous Cell Carcinoma.

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Introduction Canine sinonasal carcinoma and feline oral squamous cell carcinoma are locally aggressive diseases which result in average survival times of less than one year despite conventional oncologic treatments. Patients are often treated with full course radiation despite these poor results, as survival times are greater than with no treatment at all. Gemcitabine is a synthetic pyrimidine nucleoside analogue which has cytotoxic activity against several solid tumor types, including head and neck carcinomas. In addition to its cytotoxic effect, gemcitabine is a proven radiosensitizer. This radiosensitization occurs at concentrations of 0.1 - 10 nmol/L in vitro, resulting in appropriate nucleotide depletion at noncytotoxic doses. It was our hypothesis that the addition of gemcitabine at a radiosensitizing dose to full course radiation therapy would improve overall remission and survival times for dogs with sinonasal carcinoma and cats with oral squamous cell carcinoma.

Material and Methods This study has been designed for consideration as a Veterinary Radiation Therapy Oncology Group trial. Details of the study design will be presented. Cases accrued have come from two separate oncology facilities. Drug was graciously supplied by Eli Lilly Corporation.

Results Six dogs have been entered into the trial. Average radiation dose was 53 Gray in M-F fractions. Average number of gemcitabine doses was 5.5 per patient. Average dose was 43 mg/M$^2$. Five of six dogs required chemotherapy postponement due to moderate neutropenia. Two dogs required postponement due to severe neutropenia. Two dogs have died due to progressive disease at 6 and 8 months. One dog has had recurrence at five months. Three dogs are alive and free of disease at 1, 4, and 7 months. Four grade two and 4 grade three normal tissue toxicities were noted during radiation therapy. No radiation postponements occurred. Six grade two and 2 grade three normal tissue toxicities were noted at rechecks. Average number of recheck exams per patient is three. No dog has been followed longer than 8 months.

Three cats have been entered into the trial. One cat had concurrent lymph node metastasis. One cat had pulmonary metastasis. Average radiation dose was 54 Gray in M-F fractions. Average number of gemcitabine doses was five per patient. Average dose was 24 mg/M$^2$. Four moderate neutropenia events required chemotherapy postponement. Two grade two toxicities occurred during radiation, and two at time of recheck. Average number of recheck exams per patient is 3.3. No cat has been followed longer than ten months.

Discussion Updated results will be provided during presentation. At this time, too few cases have been entered into this trial to make adequate conclusions regarding the efficacy of gemcitabine as a radiosensitizer. It is our goal to have this trial accepted as a VRTOG trial for improved case accrual.
THE UTILITY OF CONTRAST ENHANCED COMPUTED TOMOGRAPHY IN FELINE VACCINE ASSOCIATED SARCOMAS: 35 CASES.

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Purpose: The purpose of this study was to determine the utility of contrast enhanced computed tomography (CT) in the evaluation and treatment of cats with vaccine associated sarcomas. Presentation at a referral institution is often following intervention after one or more previous surgical resections. In the current study a CT scan was performed prior to therapy to determine the extent of disease at initial presentation in comparison to physical examination findings, and to evaluate the utility of imaging in treatment decisions.

Methods: 35 cats with a presumptive or biopsy proven diagnosis of vaccine associated sarcoma that presented to the University of California Veterinary Medical Teaching Hospital were entered into the study. Vaccine history was obtained. Physical examination included caliper measurements of the tumor in 3 dimensions. All cats had complete blood work (complete blood cell count, chemistry panel, and urinalysis), T4, Felv and FIV tests, three view thoracic radiographs, biopsy with routine histopathology, and a CT scan. CT scans were conducted using a General Electric 9800 scanner. A series of 3 mm contiguous axial images were acquired through the mass using a soft-tissue software algorithm prior to administration of contrast medium. Conray® 400 contrast medium was administered intravenously as a bolus at 1 cc/lb and repeat CT evaluation was immediately performed. Tumor measurements were obtained based on physical examination and pre- and post-contrast CT images. Tumor volume was measured as the product of three dimensions multiplied by \( \frac{1}{6} \). Additional information abstracted from the CT images included characterization of tumor appearance, number of muscles involved, and whether or not there was evidence of bone involvement.

Results: Age ranged from 4-15 years (median = 10), and there were 21 FS, and 14 MC. Breeds included 22 DSH, 5 DMH, 4 Siamese mix, 3 DLH, and 1 Himalayan. Body weight ranged from 2.9-7.3 kg (median = 5 kg). Tumor appearance on CT included a contrast enhancing mass with a centrally necrotic appearing region and peripherally tendrils of contrast enhanced tissue with extension into the surrounding normal tissue. The number of muscles involved based on the post-contrast CT images ranged from 1-22 (median = 7). Based on caliper measurements the tumor volume ranged from 1.4-281.1 cm\(^3\) (median = 23.4, mean = 46.6). The pre-contrast tumor volume ranged from 1.6-384.2 cm\(^3\) (median = 44.7, mean = 75.6). The post-contrast tumor volume measurements ranged from 1.8-442.1 cm\(^3\) (median = 57.2, mean = 91.7). The tumor volume was larger based on physical examination measurements than the pre-contrast images in 2 cats, and both the pre- and post-contrast CT images in 3 cats. For the remaining 30 cats the pre- and post-contrast tumor volumes were greater than the volume determined based on physical examination. None of the cats had evidence of bone involvement. On histopathology the tumors were diagnosed as fibrosarcoma (n=30) or sarcoma (n=3); results are pending for 2 cats.

Discussion: Contrast enhanced CT images were useful in determining the full extent of disease. Recommendations were often altered based on the CT images and included pre-operative radiation therapy and surgery when surgery alone was deemed inadequate to effect local tumor control, alterations in the surgical approach to include resection of additional muscles and/or bone, and chemotherapy alone as palliative therapy. Acknowledgement: This work was supported by a grant from the Vaccine Associated Feline Sarcoma Task Force.
INTRODUCTION
Late effects of radiation therapy could potentially occur in certain tissues as early as 3 months after completion of therapy. Many tissues are difficult to evaluate with external examination. Computed tomography (CT) has been used in human- and experimental canine studies as a non-invasive method to study brain tissue after radiation. CT could also be helpful to quantitatively and over time assess changes in tissue density of various other normal tissues irradiated. Potential late effects could be detected at an earlier stage. The purpose of this study was to establish a method to evaluate certain tissues (brain, muscle, bone, eyes) post irradiation using CT – and to see if density changes in these tissues could be documented over time and if these changes correlated with any potential problems.

MATERIAL AND METHODS
Six dogs who underwent conformal proton radiation therapy for nasal tumors and were followed-up for at least 6 months post treatment were included in the study. Animals were irradiated with total doses of 45.5-52.5 CGE with 3.5 CGE fractions. All dogs had computerized treatment planning which allowed exact calculation of the dose delivered to each tissue examined. Pre- and postcontrast CT’s were performed before, and every 6 months after therapy. Twelve regions were selected for quantitative CT evaluation: The center of the neoplasia itself, the frontal lobe, the temporal lobe, lenses and vitreous of both eyes, the temporal muscle, the palatine, maxillary and mandibular bone. Regions of interest were drawn in areas of 100% dose (frontal lobe, maxillary and palatine bone) and 0% (temporal lobe, mandible) for comparison. The dose applied to the eyes varied between 30% (non-tumor sided eye) and 80% (tumor sided eye). The pre- and post contrast studies were displayed simultaneously on the monitor, and a cursor was used to delineate regions of interest. Mean CT-HU values for each anatomic region were calculated.

RESULTS
Before radiation therapy the density of the frontal lobe (mean: 33.5 HU) was higher than the density of the temporal lobe (mean 25.6 HU) in all animals. Six months after therapy the density in the untreated temporal lobe remained unchanged, whereas the density in the frontal lobe (100% dose) (mean: 40.5 HU) increased. At the 12 months follow-up the frontal lobe density decreased to values before radiation therapy. Densities in the temporal lobe remained unchanged. In 4 animals a small proportion of temporal lobe was also treated to 100% and the same observation with an increase after 6 months followed by a decrease was found. Density values varied for all bone tissues before and also after radiation therapy. No consistent change over time could be detected. There was also no consistent increase in density of the lenses in either of the two eyes and the muscle.

DISCUSSION
The higher density of the frontal lobe before radiation was an unexpected finding. All these dogs had tumor in the caudal nasal cavity and the increased density of the frontal lobe may represent neoplastic infiltration. At this time it is unclear, why after 6 months, density in the irradiated brain increased. Further studies are needed to elucidate these questions. However, the use of sequential CT-density measurements appears to be promising.
DECREASING DOSE PER FRACTION MODIFIES LATE EFFECTS FOLLOWING PELVIC IRRADIATION IN DOGS

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Introduction/Purpose: External beam radiation therapy (EBRT) to the pelvis is used to treat malignancies of the prostate, bladder, and sublumbar lymph nodes. The anatomy of this region dictates that normal tissues such as colon, urethra, and sometimes small intestine are included in the radiation field. These tissues are at risk for developing both acute and late radiation side effects. The incidence of late radiation effects following pelvic irradiation in dogs and factors that increase the risk of these effects have not been reported.

Methods: Medical records of all dogs who were treated with curative intent EBRT to the pelvic region at Colorado State University between 1993-1999 were reviewed. Patients with survival or follow-up longer than 9 months or any patient that developed late complications earlier than 9 months were included in this study. Total dose, dose per fraction, treatment field size, organs in the field, length of colon irradiated, adjuvant chemotherapy, and occurrence and severity of late effects were recorded.

Results: Sixteen dogs met criteria for inclusion in this study. All dogs were treated with a 6 MV linear accelerator with bilaterally opposed beams. Diseases treated included transitional cell carcinoma of the bladder, transitional cell carcinoma of the prostate, and anal sac apocrine gland adenocarcinoma.

- Dose/fractionation schemes used were 49.5 Gy in 3.3 Gy fractions (n=4), 54 Gy in 3.0 Gy fractions (n=5), 54 Gy in 2.7 Gy fractions (n=5), and 18 Gy intraoperative radiation therapy followed by 43 Gy EBRT (n=2). All dogs were treated Monday through Friday. Implantable chemotherapy in the form of an OPLA-Pt sponge was used in 6 dogs as a radiation sensitizer.
- Nine dogs (56%) had colitis as a late effect of EBRT. Colitis was characterized as mild (i.e. did not require treatment or responded to increased dietary fiber) in three dogs, moderate (i.e. intermittent colitis that sometimes responded to dietary or medical management) in one dog, and severe (refractory to medical and dietary interventions or resulted in gastrointestinal perforation) in five dogs.
- Two dogs had intestinal perforation and one had a colonic perforation following EBRT. In one dog the perforation followed colonoscopy and biopsy 310 days after EBRT. Two dogs had small intestinal perforation and peritonitis at 209 and 258 days following EBRT. All three dogs had been treated with OPLA-Pt as a radiation sensitizer. In the five dogs that received 54 Gy in 2.7 Gy fractions, side effects ranged from no late effects (n=4) to moderate intermittent colitis (n=1).

<table>
<thead>
<tr>
<th>Total dose : dose/ fx</th>
<th>49.5 Gy : 3.3 Gy/ fx</th>
<th>54 Gy : 3 Gy/ fx</th>
<th>54 Gy : 2.7 Gy/ fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe late effects</td>
<td>3/4 (75%)</td>
<td>2/5 (40%)</td>
<td>0/5 (0%)</td>
</tr>
</tbody>
</table>

Discussion/Conclusion: Late effects to the colon and intestine can be devastating. All dogs with severe or life threatening side effects received 3 or 3.3 Gy per fraction and 80% received radiation sensitizers. The risk of late effects to the colon can be minimized by giving smaller doses per fraction and avoiding systemic radiation sensitizers.
Preliminary Results of Post-Surgical Iridium-192 Brachytherapy for Vaccine-Associated Sarcomas in 18 Cats

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Introduction
Vaccine-associated sarcomas have been discussed in the literature for several years. Surgical excision of these neoplasms has reportedly achieved variable, but limited success. Of those cats treated surgically, time to first recurrence of the tumor has ranged from 94 - 325 days (~3 - 10 months), with a median overall survival time of 576 days (~19 months). Less than 14% of the cats receiving surgery alone survived greater than 2 years. Cats with neoplasms located on the limbs had longer time to recurrence than cats with neoplasms at other sites. (A.E. Hershey, K.U. Sorenmo, M. J. Hendrick, et al.; JAVMA 216 (1), pp. 58-61, January 1, 2000.)

Methods
In an effort to improve the prognosis of 18 cats affected with vaccine-associated sarcomas, iridium-192 temporary interstitial implants were utilized post-surgically to irradiate their tumor excision sites. Pathology diagnosis of the tumors included: fibrosarcoma (15), soft tissue sarcoma (1), giant cell tumor (1), and myxosarcoma (1). Radiation doses utilized were: 4000 cGy (2), 4,500 cGy (4), 5,000 cGy (7), and 6,000 cGy (5). Implant time was 5 days (1), 6 days (2), and 7 days (15). Treatment field size varied, with a mean and s.d. of 62 +/- 32 sq.cm.

Results
Present results are preliminary, and follow-up of the patients response to post-surgical iridium-192 brachytherapy continues. As of 8/2000, results include: tumor recurrence by 5 and 6 months (4000 cGy); recurrence by 8 months (4,500 cGy), no recurrence by 5, 5 and 9 months (4,500 cGy); no recurrence by 6, 14, 14, 14, 24 and 42 months (5,000 cGy); recurrence by 4, 6 and 7 months (6000 cGy), and no recurrence by 6 and 8 months (6,000 cGy).

Generally, the tissues tolerated the treatment well. Reported tissue reactions included: change in hair color, hair loss or slow hair regrowth (9), wound dehiscence (5), and seroma formation (1).

Conclusion
Based on these preliminary results, iridium-192 appears to be an acceptable form of adjunctive therapy for vaccine-associated sarcomas in cats.
Introduction: Hyperthermia has been used as a modifier of radiation therapy for many years. Despite difficulties in heating some tumors, and in quantifying heat dose, there are positive Phase III trials in spontaneous animal tumors and in human tumors where tumor control following combined treatment with radiation and hyperthermia is superior to that achieved from radiation alone. Recently, new applications have emerged which have potential to increase the utility of hyperthermia for cancer treatment. One such application is the use of hyperthermia as a promoter for gene therapy. Increased temperature initiates induction of protein formation via the heat shock response. It has been proposed that this response could be used as a trigger to initiate gene function. The purpose of this presentation is to review the principles of this new use of hyperthermia, and to describe initial clinical results.

Methods: At Duke University, the gene for expression of the cytokine IL-12 was placed under control of the hsp70 promoter and cloned into a replication deficient adenoviral vector. In laboratory experiments, hyperthermia was shown to activate the promoter resulting in induction of IL-12, and subsequent tumor growth delay in mice. A Phase I study was initiated in vaccine associated sarcomas in cats. Tumors were injected with $10^9$-$10^{10}$ plaque forming units using superficially placed grid marks as a guide. The vector was engineered such that either IL-12 or green fluorescence protein (GFP) were the genes under control of the heat shock response. Twenty-four hours following virus injection, the tumor was heated using microwaves. Twenty-four to thirty-six hours after hyperthermia the tumor was excised and tissue analyzed for either IL-12 or GFP. Four cats have been studied.

Results: In the first two cats, no evidence of viral infection or induction of gene product were found. Retrospectively, the volume of injectate was judged to be too small in relation to the mass of the tumor in these cats. In the third cat, injected with the GFP gene, there was clear evidence of viral infection and induction of GFP. In the fourth cat, injected with the murine IL-12 gene, there was evidence of viral infection and induction of IL-12.

Conclusions: Gene therapy using the heat shock response as the promoter is feasible in spontaneous tumors. Intratumoral viral injection followed by hyperthermia results in measurable expression of gene product. This avenue for gene therapy has the advantages of low systemic viral exposure and localization of the promoter to the tumor.
A TECHNIQUE FOR MICROAUTORADIOGRAPHY USING $^{18}$F-FDG

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Introduction
Microautoradiography is a technique used to identify the presence, amount, and location of radioactivity within tissue at the light microscopic level. Tissue uptake of $^{18}$F-FDG at the cellular level has not been widely evaluated. Reported techniques for microautoradiography using $^{18}$F-FDG vary considerably. The purpose of this study was to determine the procedure which worked best in our laboratory. The techniques which gave us optimal results are presented here.

Materials and Methods
Adult rats (>300 g body weight) were used for this study. Rats were fasted overnight. On the day of the study, glucose (150-175 mg IV) was administered 20 minutes prior to administration of the $^{18}$F-FDG to promote glucose uptake by myocardial cells. A 2 mCi dose of $^{18}$F-FDG was administered intravenously. One hour later, following humane euthanasia, brain and heart were harvested. Sections of brain and heart were immediately embedded in O.C.T. compound (Miles Inc., Elkhart, IN) and frozen in isopentane cooled in liquid nitrogen. Frozen tissue was sectioned on a cryostat at -20 C. Several sections (8 um thick) were obtained from the middle of the tissue. Sections were mounted on slides coated with NTB2 nuclear emulsion (Eastman Kodak, Rochester, NY) diluted 1:1 with 600 nM ammonium acetate. Slides were placed in light-tight boxes cooled with dry ice and exposed overnight (20-24 hours). Following exposure, slides were placed for 1 minute in ethanol with 5% acetic acid which had been cooled with dry ice, then for 1 minute in ethanol with 5% acetic acid at room temperature. Slides were washed in deionized water for 2 minutes, then developed in Dektol Developer (Eastman Kodak, Rochester, NY) at 15 C for 2 minutes. Slides were dipped in deionized water for 10 seconds, then fixed in Kodak Fixer (Eastman Kodak, Rochester, NY). Slides were washed in running water for 15-30 minutes then stained with Mayer’s hematoxylin.

Results
Staining with Mayer’s hematoxylin gave excellent contrast between silver grains and cell nuclei, compared with standard hematoxylin and eosin stain. Selective uptake of $^{18}$F-FDG by different cell populations could be distinguished, but differences in uptake by individual cells could not be discerned.

Conclusions
Results of this study suggest that uptake of $^{18}$F-FDG in tissues may be studied using microautoradiography using the technique described. Uptake of $^{18}$F-FDG cannot be determined on an individual cell basis, but uptake between different cell populations is possible.
UPTAKE OF $^{18}$F-FDG BY FUNGAL-ASSOCIATED INFLAMMATION, NON-FUNGAL INFLAMMATION, AND TUMOR

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Introduction

Positron emission tomography (PET) using fluorine-18-fluorodeoxyglucose (FDG) is widely used for oncologic imaging. FDG-PET is particularly valuable for distinguishing benign from malignant disease. Many of the lesions resulting in false positive diagnosis for tumor on FDG-PET imaging are granulomatous inflammatory lesions caused by fungal infection, tuberculosis, and sarcoidosis. In some cases, uptake of FDG by fungal lesions is even greater than for neoplastic lesions. The objectives of this study were to describe the distribution of FDG uptake in *Blastomyces*-induced granulomas, and to test the hypotheses that that uptake of FDG by fungal associated inflammation is greater than for non-fungal benign inflammatory lesions and for malignant lesions.

Materials and Methods

In rats of Group 1, subcutaneous *Blastomyces* granulomas and subcutaneous turpentine abscesses were induced. In rats of Group 2, *Blastomyces* granulomas and subcutaneous lymphomas were induced. On the day of harvest of the lesions, rats received 2 mCi FDG IV. One hour later the DUR for lesions and a sample of muscle were calculated. Tissue sections were placed in contact with radiographic film for macroautoradiography.

Results

The median (range) DURs for the *Blastomyces* granulomas, turpentine abscesses, and muscle from the rats in Group 1 were 1.9 (1.1-2.6), 0.9 (0.6-1.4), and 0.2 (0.1-0.5), respectively. There was a significant difference in the DURs among the three tissue types ($p < 0.001$). The median (range) DURs for the *Blastomyces* granulomas, lymphomas, and muscle from the rats in Group 2 were 1.8 (1.2-3.4), 1.9 (1.0-4.0), and 0.2 (0.1-0.3), respectively. There was a significant difference between the median DURs from the three tissue types ($p = 0.001$). Macroautoradiographs of the *Blastomyces* granulomas revealed intense uptake of FDG by the granulomatous inflammation.

Conclusions

The DUR of experimentally induced fungal-associated inflammation (*Blastomyces* granulomas) was higher than for experimentally induced non-fungal inflammation (turpentine abscesses). The DUR of *Blastomyces* granulomas was as high, but not higher than for experimentally induced lymphomas. The DUR of the experimental lymphomas may have been influenced by the associated marked inflammatory reaction that is not typical of natural disease.
COMPUTED TOMOGRAPHY FEATURES OF BRAIN INFARCTION IN AN AMERICAN PERSIA FELINE ASSOCIATED WITH DIABETES MELLITUS

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**Introduction:** This study describes the computed tomographic findings of brain infarction in an American Persia feline associated with diabetes mellitus.

**Methods:** Twelve-year-old male American preach was presented with sign of circling movement and weight loss. The body weight was 3.4 kg. The patient showed left turning movement and concussion of eyes. Seizures, ataxia and hypersensitivity were observed. CPK was 1,427 IU/L. CSF revealed no infectious diseases. FeLV, FIV, FIP and Toxoplasma were all negative. The cat was placed in sternal recumbency for initial CT scan to obtain the scout view. The image plane (2-mm thickness, 2-mm interval) was then positioned just cranial to the brain. After normal scanning, the cat was injected iodinated contrast medium (Iohexol 300) into the cephalic vein using an automatic pressure injector, and obtained the contrast CT image. The dose was 1ml/kg and the injection rate was 1ml/sec. The cat was treated for 10 days, but there is no improvement. Therefore, the patient was euthanized by barbiturate.

**Results:** A CT image showed widely hypodense area in the right medulla adjoined right ventricular. The right ventricle was pressed by hypodense area. The hypodense area was also observed in the left medulla, but left side hypodense area was very small. The Hunsfield units were 15.0 in the hypodense area, and 33.8 in the caudate nucleus, respectively. Calcification was observed in the rostral cerebral artery, middle cerebral artery and caudal communicating artery. A slight contrast enhancement was only observed surrounded the hypodense area, and there was no contrast enhancement in the hypodense area.

**Histologic findings:** Massive ischemic necrosis was found in the right corpus striatum and diencephalon. Microfocal necrosis was found in the left brain. Arteriosclerosis resulted in aneurysm was found in middle cerebral artery.

**Conclusions:** In this case, the CT findings of an ischemic necrosis of the brain were characterized by hypodense area and slight contrast enhancement surrounded hypodense area.
INTRODUCTION:

In the turkey production industry (IND), it is standard practice to feed higher levels of Ca and non-phytate Phosphorus (npP) than the National Research Council (NRC) recommendations, in order to promote the growth of a stronger skeleton. Elevated dietary npP leads to an increase in P content in the manure, which is undesirable due to resulting environmental contamination, particularly eutrophication of the water. The purpose of this study was to determine the effect of varying concentrations of dietary Ca and npP on bone size, density and breaking strength in turkeys.

METHODS:

Turkey poults (870) were divided into 6 groups (5 replications of 29 birds/pen). All poults were fed a Ca: npP ratio of 1.8:1 at 0-6 wks then 2:1 until slaughter at 17 wks. From 3-17 wks, Ca and npP levels were varied between groups. At 3-9 wks, groups 1-3 were fed NRC Ca and npP levels then at 9-17 wks, these levels were adjusted: 1) low (75% of NRC); 2) NRC; 3) IND. At 3-9 wks, groups 4-6 were fed IND Ca and npP levels then at 9-17 wks, these levels were adjusted: 4) low (75% of NRC); 5) NRC; 6) IND. After slaughter, the tibiae were cleaned of soft tissues and computed tomography (CT) was performed with the bones positioned on a pad containing hydroxyapatite bone density standards. Image data were analyzed for cross-sectional area of total (TBA) and cortical (CBA) bone. Bone mineral density (BMD) was measured by quantitative CT (QCT). Bone strength was measured as the breaking load on the three point bending test. Linear regression ANOVA was used to examine data for treatment effects and to identify a relationship between CT bone measurement(s) and breaking strength.

RESULTS:

Mean values of bone size, bone mineral density and breaking strength were as follows:

<table>
<thead>
<tr>
<th>GROUP</th>
<th>CBA (cm²)</th>
<th>TBA (cm²)</th>
<th>BMD (mg/cm³)</th>
<th>LOAD (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.851</td>
<td>2.070</td>
<td>300.8</td>
<td>576.8</td>
</tr>
<tr>
<td>2</td>
<td>.884</td>
<td>2.076</td>
<td>304.3</td>
<td>552.7</td>
</tr>
<tr>
<td>3</td>
<td>.903</td>
<td>2.178</td>
<td>320.8</td>
<td>674.9</td>
</tr>
<tr>
<td>4</td>
<td>.833</td>
<td>2.019</td>
<td>302.0</td>
<td>559.8</td>
</tr>
<tr>
<td>5</td>
<td>.820</td>
<td>1.979</td>
<td>309.0</td>
<td>529.9</td>
</tr>
<tr>
<td>6</td>
<td>.889</td>
<td>2.102</td>
<td>313.7</td>
<td>595.4</td>
</tr>
</tbody>
</table>

There was no difference between treatment groups in bone size, BMD or breaking strength. A strong direct linear relationship was present between BMD and breaking strength (P= 0.0001) while CBA and TBA were not directly related to breaking strength.

CONCLUSION:

There was no evidence from this data that increasing Ca and npP above NRC recommendations benefited bone development in turkeys. A strong linear relationship was demonstrated between BMD, as measured by QCT, and bone breaking strength.
Purpose: To describe the pre- and post-treatment computed tomographic (CT) features of nasal aspergillosis in dogs.

Methods: Initial (n=35) and follow-up (n=12) CT scans were available from 35 patients with nasal aspergillosis. Twenty-four CT examinations, including all controlled dogs, were obtained on a fourth generation helical CT and 11 examinations were obtained on a third generation conventional CT. Contiguous 2mm thick slices were performed. Pre- and post-contrast studies were made. Dorsal reconstructions were performed in all cases.

Results: Lesions were generalized in 26 cases (74%) with the contralateral side affected in 19 cases (19/26=73%). The lesions were restricted to the nasal passages in 9 cases (9/26=26%) with the contralateral side affected in 4 cases (4/9=44%). Frontal sinus lesions (26 cases) presented with a rim pattern in 19 cases (19/26=73%). The lesions of the frontal sinus were associated with a large amount of abnormal soft-tissue around the sino-frontal ostium in 24 cases (24/26=92%). The frontal bone was affected in 24 cases (24/26=92%). Nasal passages lesions were present in all cases with a variable amount of turbinate destruction and abnormal soft-tissues. Cribriform plate destruction and retrobulbar space invasion were present in 2 cases (7%). Abnormal soft-tissues were present in the caudal recesses in 15 cases (43%) and bony lesions in 5 cases (14%). Abnormal soft-tissues were present in the maxillary recesses in 24 cases (73%) with lysis of the ethmoid bone in 17 cases (49%). The maxillary bone was affected in 16 cases (46%). The nasal septum was affected in 26 cases (74%). Dorsal reconstructions showed a cavitating process in all cases (100 %). Attenuation values measurement were non-specific. Follow-up examinations revealed a decrease in soft-tissue material in all but one case (11/12=92%) but this reduction could not be quantified.

Conclusion: The most encountered CT features were a moderate to severe destruction of the turbinates with presence of a variable amount of soft-tissue in the nasal passages, a non-specific thickening of the mucosa along the surrounding bones of the frontal sinus, maxillary recess and nasal cavity and, thickened reactive bone.
The aim of this study was to determine whether tendon orientation in the static field may be responsible for the frequent occurrence of increased MRI signal intensity within normal equine deep digital flexor tendon (DDFT).

Five equine isolated limbs with no radiographic abnormality were evaluated with a knee coil in a 1.5 Tesla magnetic field, using short echo time sequences (TE = 15 ms). Imaging was performed on each isolated limbs in 3 different positions, with and without extension of the fetlock joint: DDFT orientation ranged from 30° to 70° in relation to the constant magnetic field (B₀). All the limbs were dissected after imaging to check for the absence of gross tendon abnormalities.

Markedly increased intratendinous signal intensity was observed when the angle between the DDFT and B₀ approached to 55° (“magic angle”). The increase of signal intensity was independent from the extension of the fetlock.

Tendon orientation demonstrated to greatly affect DDFT signal intensity on short echo time sequences: distinguishing “magic angle” effect from pathological signal abnormality, due to degeneration or tear, requires close comparison between T1 and T2 weighted images.