



## NEURO IMAGING 101

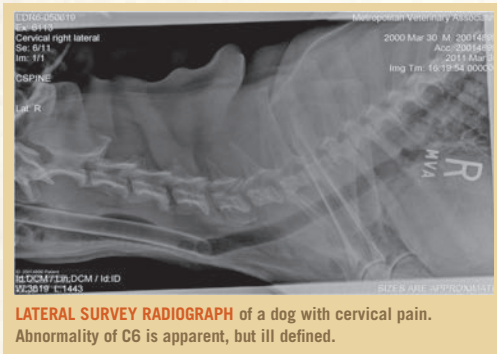
The neurologic examination should begin in the waiting area as you observe the gait and overall mentation of the patient as the client brings them to the exam room. The examination allows you to determine which area of the neurologic system is involved and helps you to decide which type of imaging will be best in helping to make the diagnosis. The imaging modalities that we consider are plain radiographs of the skull or spine, as well as CT-scan or MRI. Diagnostic results are best obtained through the use of general anesthesia. How to determine which modality to use is based on adequate knowledge of the modality, the specific circumstance of the patient, and the clinician in charge.

As a general rule when considering a CT scan or MRI, bone is best examined by CT scan and soft tissues are best seen with MRI. For example, a CT Scan would be chosen to examine: *nasal sinuses, long bones, joints, lung, or inner/middle ear.* (A CT with contrast is useful for nerve sheath tumors of the brachial plexus).

An MRI would be chosen for: *brain, spinal cord, soft tissue masses, etc.*

### CONVENTIONAL RADIOGRAPHY

Along with bony structures, conventional radiography is also useful for soft tissue evaluation. The biggest advantage is that it is typically available in most veterinary hospitals. Digital radiography allows us to see the images almost immediately, with little to no anesthesia, and it is relatively inexpensive.



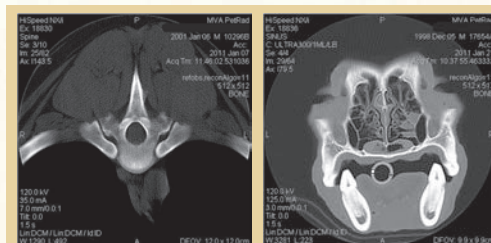
The biggest disadvantage in the imaging of the central nervous system is that soft tissues such as brain and spinal cord cannot be seen, nor can a normal intervertebral disc. The skull is particularly difficult to image due to the many bones (three dimensions represented in only one) and structures within the skull. In order to make the final diagnosis, the technical staff taking the images



needs to be trained on positioning and radiographic technique. The interpreter of the films needs to then rely on the overall quality of the image and on their own experience. Finally, we must also consider radiation exposure of the employees and pets by using the proper radiation protection and monitoring equipment. There is a certain amount of record keeping involved as well, to comply with federal, state and local requirements.

### CT-SCAN

Computerized Tomography (CT) is the reconstruction of X-ray images by a computer to present tissue slices in a view similar to conventional radiography. Images are obtained by moving the patient through a ring shaped gantry which contains the X-ray tube. The tube moves in a circle around the patient with radiation exposure at multiple points around a central axis. Images are obtained for purposes of



CT-SCAN of a SPINE near the thoracolumbar junction. This is an axial view with no contrast used for the imaging.

CT IMAGE of a NOSE. Axial view of a normal nose without contrast.



Jerry W. Northington, DVM

## NEWS & EVENTS

### UPCOMING CONTINUING EDUCATION & EVENTS

For questions or to R.S.V.P. for any of these events please contact Sarah Spurgeon at [sspurgeon@metro-vet.com](mailto:sspurgeon@metro-vet.com) or 610.666.1050

### ECG Lecture for Veterinary Nurses

September 5 • 6:30pm

Risa Roland, DVM, ACVIM (Cardiology)

Dinner provided – 2 CE credits

### “WHAT’S NEW IN ONCOLOGY” at Seasons 52

October 10 • 6:30pm

Suzanne Rau, DVM, DACVIM (Oncology)

Dinner provided – 2 RACE credits

### Technician VTNC Program

November 2 • 9am – 4pm

Breakfast & Lunch provided – 7 CE credits

### IMAGING ROUNDS

Imaging rounds will take place the first Wednesday of every month

### SAVE THE DATE

### MVA 5K & Kids Fun Run

October 12

Registration: 7:30am, Events start 9am

(See back page for details)

### Client Education

MVA will be holding quarterly lectures on Canine/Feline CPR & basic first aid for our community of pet owners starting this Oct. (1<sup>st</sup> class will be on 10/24 at 6:30pm). Includes: presentation, hands-on sessions & important take-home materials. We're dedicating available space in our 1<sup>st</sup> class for your office team. If interested contact Sarah Spurgeon at [sspurgeon@metro-vet.com](mailto:sspurgeon@metro-vet.com).

(See back page for details)

### METROPOLITAN VETERINARY ASSOCIATES & EMERGENCY SERVICES

2626 Van Buren Avenue  
Norristown, PA 19403

610.666.1060 – fax 610.666.1199

# METROPOLITAN VETERINARY ASSOCIATES

ESTABLISHED 1986



Providing Specialized Veterinary Services  
& 24 HOUR EMERGENCY CARE

## CARDIOLOGY

Michael Miller, MS, VMD, ABVP  
Risa Roland, DVM, DACVIM (Cardiology)

## DENTISTRY

Paul Orsini, DVM, DACVS, DAVDC

## DERMATOLOGY

Karen B. Farver, DVM, DACVD

## EMERGENCY SERVICES

James Buckman, VMD, PhD  
Jason Chamberlin, VMD  
Jennifer McGough, VMD  
Meghan Romano, DVM  
Nicolas Rose, VMD  
Marisa Savannah, VMD  
Dana Yard, VMD

## INTERNAL MEDICINE

John V. DeBiasio, DVM, DACVIM  
James F. Dougherty, MS, VMD  
Leslie A. Kuczynski, VMD, DACVIM

## NEUROLOGY

Jerry W. Northington, DVM

## ONCOLOGY

Suzanne Rau, DVM, DACVIM (Oncology)

## OPHTHALMOLOGY

Amanda Corr, VMD, DACVO  
Stephen L. Gross, VMD, DACVO

## RADIOLOGY

Robert C. McLear, VMD, DACVR

## REHABILITATION

Ann M. Caulfield, VMD, CCRP, CVA

## SURGERY

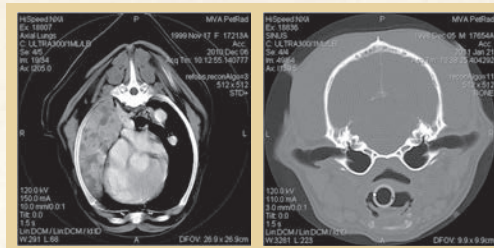
Lori W. Cabell, DVM, DACVS  
A. Jon Nannos, DVM  
Jacqui Niles, BVETMed, SAS, DACVS  
Catherine Popovitch, DVM, DACVS, DECVS  
Timothy M. Schwab, VMD  
Joseph Tsang, DVM

## HOSPITAL ADMINISTRATOR

Stacey Connell

## HOSPITAL MANAGER

Kara Bilardo, CVT

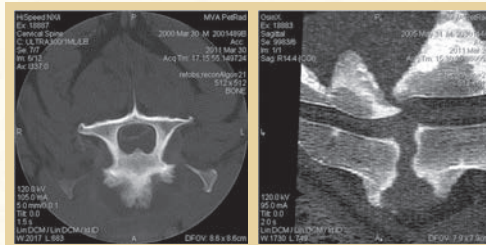


**CT-SCAN of a CHEST** with a large mass near the heart.

**CT-SCAN of a HEAD** showing the detail available in the middle/inner ear with proper machinery and technique. Both bullae and the bones of the inner ear are seen in the image. The bullae are air-filled with normal external ear canals on both sides.

evaluating positioning (*scout images*) followed by series through the area of interest.

The computer then reconstructs the image for presentation on a screen based on the data from all the points of exposure. Each imaging series is represented on screen by a slice which may vary in thickness depending on the requirements of the study. For many patients the initial series is made of thicker slices to allow for faster imaging. This is followed by thin slices to evaluate a smaller area of interest such as a bony lesion or a disc protrusion. The standard representation makes the images appear as if the viewer is seeing the patient from



**CT-SCAN of the abnormal vertebral body.** A bone tumor, presumably osteosarcoma, is invading the vertebral body.

**CT-SCAN of the LUMBOSACRAL SPACE** reconstructed in a sagittal view. Subluxation of the vertebrae is evident. This is a young dog with acute onset of lumbosacral pain. The ventral spondylosis suggests a more chronic lesion with possible instability predisposing the final injury.

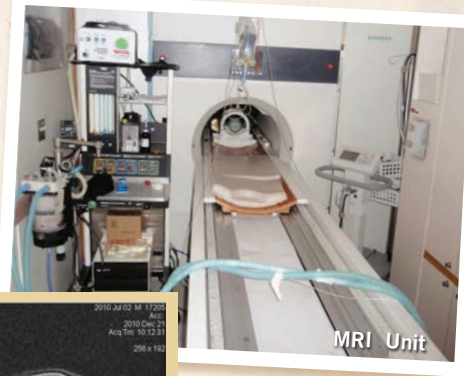
the nose or cranial end in axial sections and left to right with sagittal images.

Advantages of the procedure include increased sensitivity for X-ray imaging with lower overall exposure of the patient to radiation. There is also the ability to reconstruct alternate views with computer processing. Even 3-D images may be obtained by proper computer processing. Alternate colors beyond black and white may be assigned to allow easier examination of different tissues. Bone imaging is excellent.

Every procedure comes with certain disadvantages and CT imaging is no exception. The equipment is costly both to install and to maintain. Imaging requires more time than conventional radiography in most instances and for small animal patients requires general anesthesia. Technician and veterinarian training take time and investment in order to offer the best service. Given the complexity of the procedure the monetary costs to a client are significant.

## MRI (MAGNETIC RESONANCE IMAGING)

Considering all of the current most readily available imaging modalities, magnetic resonance



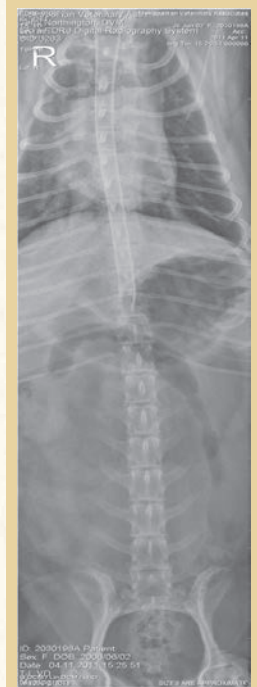
**MRI of a HEAD**, sagittal section near the midline without contrast, no abnormality noted.

**MRI Room with non-magnetic anesthesia equipment. All monitoring and anesthetic equipment inside the room must be MRI compatible with all non-magnetic materials.**

imaging (MRI) is the most complex. MRI offers the best soft

tissue imaging available today for most uses. The process is complicated by a requirement for equipment that is very costly to install and maintain plus a very high level requirement for technician training. The time required for best images is longer than with either CT-scan or conventional radiography and general anesthesia is a necessity to insure patient cooperation. The strength of the magnet used for imaging lends certain dangers to personnel in the room as no ferrous metals may be nearby. Credit cards, jewelry, pens, and keys all represent danger if the magnet attracts the material and creates a flying object. The presence of identifying microchips produces an imaging artifact as will any metal implant or in the case of many hunting dogs buckshot which may be lodged in skin or muscle.

MRI works by aligning hydrogen atoms (protons) in a magnetic field. Think of a room filled with floating gyroscopes aligned in



**VENTRODORSAL VIEW thoracolumbar spine with left side disc protrusion..**



**LATERAL CERVICAL MYELOGRAM** at or near the time of initial injection. Disc protrusion C2-C3 with dorsal deviation of the ventral contrast column. This is a typical appearance of cervical disc protrusion in the canine patient.

opposite directions with a majority in one plane. A radiofrequency signal (RF) is applied for a time (T). The energy instilled in the atoms is then released by the protons measured and plotted by computer to produce the images we see.

**VARIOUS TERMS are utilized for everyday use in this technology.**

**T1 – Time for atoms to recover to the initial longitudinal direction**

**T2 – Time for atoms to dephase to their original state from the synchronous state induced by the magnet**

**SAGITTAL – equivalent to a lateral radiograph**

**AXIAL – cross sections perpendicular to the sagittal plane (think of sliced bread)**

**CORONAL – longitudinal sections parallel to the ventral surface**

MRI is an excellent imaging modality for brains and spinal cords. The application is somewhat limited in limbs but can be used successfully with the proper experience. Chests

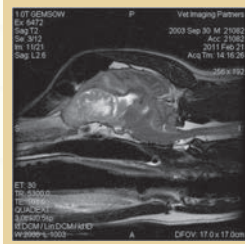


**MRI with a HYPERINTENSE LESION** in the ventral part of the brain. The imaging characteristics suggest a possible meningioma or glioma. The location along the meninges with a flat base are more consistent with meningioma but the imaging characteristics otherwise may be consistent with either form of tumor.

and abdomens may also be imaged but special techniques are necessary to eliminate motion artifacts for the best imaging outcome. As in a CT-scan, the images are presented as if the viewer is looking at the patient's front end in axial views and puts the patient with a left to right orientation in sagittal images.

**MYELOGRAPHY**

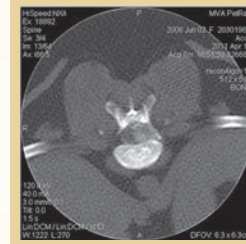
Myelography is a specialized X-ray technique utilizing an X-ray blocking chemical (Iohexal®, an iodinated sugar solution). This technique is useful when conventional radiography fails to offer enough information. A spinal tap is performed (via the cisterna magna most often in our hospital and via lumbar injection in many other facilities) Iohexal® is injected into the subarachnoid space, and conventional radiographs are taken to follow the course of the contrast down the spine. By observing the flow of contrast and the overall appearance of any obstruction or deviation, a diagnosis of compression either by tumor, ruptured disc, or other etiology may



**MRI with VERY LARGE FRONTAL LOBE LESION.** Imaging characteristics are those of a meningioma with secondary edema. The hyperintense region in the center of the mass may be a cystic structure.



**MYELOGRAM** with thoracolumbar obstruction of the dye flow. Intervertebral disc protrusion.



**MYELOGRAM/CT-SCAN** Disc protrusion left side near the thoracolumbar junction. The mass of disc material is easier to see as the material has a higher density than normal spinal cord tissue.

often be made. As an additional benefit spinal fluid may be submitted for analysis and potentially culture. Some patients have more than one disease and may have meningitis in addition to a disc protrusion or other abnormality. ■



**Risa Roland DVM, DACVIM (Cardiology)**

**INTERVENTIONAL RADIOLOGY**

Metropolitan Veterinary Associates offers a full range of cardiac as well as non-cardiac interventional radiology procedures. Interventional radiology involves the use of contemporary imaging methods (primarily Video X-Ray, called Fluoroscopy) to gain access to different structures of the pet's body for diagnostic and therapeutic reasons without the need for traditional surgery.

**DIAGNOSTIC CAPABILITIES:**

- Diagnostic Fluoroscopy
- Diagnostic Angiography
- Patent Ductus Arteriosus Embolization
- Balloon Valvuloplasty
- Pacemaker Implantation
- Heartworm Retrieval
- Arterio-Venous Fistula Embolization
- Endomyocardial Biopsy
- Catheter Retrieval
- Tracheal Stent Placement
- Urethral & Ureteral Stent Placement
- Portosystemic Shunt Embolization
- Intra-Arterial Chemotherapy
- Chemoembolization

**NON-CARDIAC**

Tracheal Stent Placement

Urethral Stent Placement

**PSS Embolization**  
Intra-Arterial Chemotherapy, Chemoembolization, Endourology & more...

**CARDIAC**

**Diagnostic Angiography**

**Balloon Valvuloplasty**  
Pulmonic Stenosis • Cor triatriatum

**PDA Occlusion**  
CDO • Amplatzer® Plug • Coil

**Pacemaker Implantation**

**Coil Occlusion**  
PDA • AV Fistula

**AVAILABILITY FOR APPOINTMENTS**  
**Dr. Risa Roland:**  
 Tuesday – Friday,  
 Hours: 9:00am – 4:00pm  
**Call for an Appointment:**  
**610.666.1050**

# You're Invited

SATURDAY

# 10.24.13

6:30PM TO 8:00PM

QUARTERLY

## Canine/Feline CPR Class

**ABOUT:** Metropolitan will be holding quarterly lectures on Canine/Feline CPR and basic first aid for our community of pet owners starting this October (*the first class will be on 10/24/13 starting at 6:30pm here at Metro Vet*). The course will include a Presentation, Hands-On Sessions and important Take-Home Materials for all attendees.

**PRESENTERS:** Samantha Travers, B.A., CVT, VTS (ECC)

**REGISTRATION:** We're dedicating available space in our first class for your office team, if you have interest in having your team members attend contact Sarah Spurgeon at [sspurgeon@metro-vet.com](mailto:sspurgeon@metro-vet.com).



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## PET LOSS SUPPORT GROUP

Many of our employees understand the depth of loss experienced when a beloved four-legged family member passes. For that reason, Metropolitan provides a pet loss support group to help grieving owners in need. Our support group is designed to provide grieving pet parents with a safe, confidential environment to share their feelings with others who have experienced pet loss.

Meetings are held once a month onsite at Metropolitan and are free of charge for your clients (all family members are invited to attend). The group is led by Dr. Cari Thomson and co-led by psychiatrist Dr. Carol Tavani.

Please contact us at 610.666.1050 if you would like to have Pet Loss Support Group brochures mailed to your office. Clients are able to visit our website to find meeting dates and times, general information and recommendations on obtaining help outside of the group setting.

Pet Loss Support Group meetings held monthly for your clients (and are free of charge). Please contact us at 610.666.1050 for more information or for brochures.



## MVA 5K & KIDS FUN RUN EVENTS

Join MVA in our 4<sup>th</sup> Annual 5K Run/Walk and Kids Fun Run Events benefiting Main Line Animal Rescue. Bring your dog along for these fun runs.

Enjoy music, give-a-ways, balloon animals by Matt Cadabra, food and beverages before and after the event. Main Line Animal Rescue will have some of their adoptable pets available for you to meet at the event as well. Proceeds from the event will benefit homeless animals rescued through Main Line Animal Rescue. Plus, MVA is pleased to welcome our very **SPECIAL GUESTS, Steve Morrison from 93.3 WMMR's "Preston & Steve Show" and author Lisa Loeb**. Lisa Loeb is the author of the book Dog Ambassador.

MVA, partnering with Valley Forge Children Academy, are proudly organizing their 2<sup>nd</sup> Annual Kids Fun Run (Ages 4-12). The course will be just over ¾ mile and filled with obstacles, plenty of canine friends to meet, balloon animals, give aways and more! Each participant will walk away with an award just for being involved and the top 3 will receive a trophy for their placement. *There is limited space, so please RSVP as soon as possible to hold a spot in the event.*

**DATE:** Saturday, October 12<sup>th</sup>

**LOCATION:** MVA, 2626 Van Buren Ave., Norristown, PA

**MVA 5K FEE:** \$20 in Advance, \$25 after October 5

**KIDS FUN RUN FEE:** FREE to all Participants

**REGISTRATION:** 7:30am, ends at 8:45am

**MVA 5K RUN/WALK EVENT ONLINE REGISTRATION AT:**  
[http://www.active.com/event\\_detail.cfm?event\\_id=2103200](http://www.active.com/event_detail.cfm?event_id=2103200)

**RAIN OR SHINE** Nothing will stop this run/walk! Please dress appropriately and remember to leash your dog.

**MVA 5K EVENTS:** Starts at 9am

**KIDS FUN RUN EVENTS:** Starts at 9:15am

**PARTICIPANTS:** FREE T-Shirt to all Pre-Registered Participants

**TO REGISTER FOR BOTH EVENTS,** contact:

Sarah Spurgeon at 610-666-1050