University of Tennessee, Knoxville

From the SelectedWorks of Darryl L. Millis

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C.A.R.E.S. (CANINE ARTHRITIS, REHABILITATION, EXERCISE, AND SPORTS MEDICINE) Newsletter

Darryl L. Millis, University of Tennessee, Knoxville

Available at: https://works.bepress.com/darryl_millis/21/
Anika is a rare dog. She is certified for search and rescue operations during times of natural disaster, such as tornados and hurricanes. She is also one of the few dogs in the United States that is certified for urban search and rescue. This is especially important in the event of natural or manmade disasters in urban areas, such as earthquakes or bombings. These unique animals are highly trained to negotiate rubble and debris, while searching for humans, whether alive or deceased. The potential dangers in this type of work are extreme -- concrete, live wires, pipes, sharp metal, unstable surfaces -- the list goes on and on. The training and conditioning for urban search and rescue can only go so far. It is inevitable that each situation is unique, and other environmental conditions, such as darkness, rain, and even snow may hinder operations.

It is obvious that such dogs are valuable in an increasingly urban-centered society. It was a real blow when Anika was injured while playing with a kennel-mate. Unfortunately, Anika sustained a Monteggia fracture, which consists of a fracture of the ulna, along with a luxation of the radial head. While an ulna fracture is an injury that is usually easily managed with a very good prognosis, a luxation of the radial head is more serious.

The elbow joint and ligaments that maintain the radius and ulna in proper position are affected with luxation of the radial head. The elbow joint is critical to the normal function and duties of a search and rescue dog that must negotiate irregular and unstable surfaces, and be able to step over obstacles.

Preoperative radiographs (above) showing a fracture of the ulna and a luxation of the radial head.

Our board-certified small animal surgeons repaired Anika's fractured ulna using a bone plate and screws (below) to provide a very stable repair for rapid return to function.

(Contd. on p. 6)
Meet the director of the CARES Center for Veterinary Sports Medicine, Dr. Darryl Millis. Dr. Millis is a board certified surgeon and Professor of Orthopedic Surgery. In addition, he is a founding charter Diplomate of the new American College of Veterinary Sports Medicine and Rehabilitation.

Dr. Millis is a co-editor of Canine Rehabilitation and Physical Therapy; Essential Facts of Physiotherapy in Dogs and Cats; Small Animal Physical Rehabilitation; Veterinary Clinics of North America-Small Animal Practice; and Multimodal Management of Canine Osteoarthritis. He is a co-founder and primary faculty member of the internationally known University of Tennessee Certificate Program in Canine Rehabilitation, which received the Outstanding Non-Credit Program Award from the Association for Continuing Higher Education. Dr. Millis has received several awards, including the World Small Animal Veterinary Association Iams Paatsama Award and the Pfizer Award for Research Excellence. His primary areas of research interests include osteoarthritis, physical rehabilitation, and gait evaluation. Dr. Millis has delivered numerous presentations at state, national and international meetings, and has authored over 200 publications, textbook chapters, and abstracts, and has generated over $1.8 million in grants and contracts.

Q: Why did you become interested in rehabilitation?
A: As a surgery resident, I noticed that physical therapy was an important part of the treatment for conditions in people, such as a torn cruciate ligament, yet we didn’t do that in dogs. I tried to adapt some of the same principles and tried to learn as much about rehab as I could. When I came to UT, I had a chance meeting with a physical therapist from UT-Chattanooga, Dr. David Levine, and we have been working together ever since.

Q: What is most important in dealing with an orthopedic case – the surgery or the rehabilitation?
A: You really need both. Certainly some conditions require surgery, but the outcome can be so much better with rehab. And doing rehab after the surgery has made me a better surgeon because you see how your cases progress, and correlate what you saw in surgery with how they do during the recovery.

Q: What has been the most rewarding part of being involved with rehab?
A: The people. I am blessed to have taught people about rehabilitation on six continents. It has been so rewarding to see the enthusiasm and growth of rehabilitation around the world, to help the animals and their owners.

Personal Focus: Dr. Darryl Millis

Dr. Millis keeps an eye on Smokey IX in the underwater treadmill during his rehabilitation from cruciate ligament surgery.
Notes from the 2nd Annual University of Tennessee CARES Sports Medicine Conference

The UT Veterinary Medical Center hosted the 2nd CARES Sports Medicine Conference in August, 2014. Owners, trainers, veterinarians and veterinary technicians attended two days of lectures, demonstrations, and laboratories. Additionally, the conference was again webcast internationally!

The focus of the conference was canine sporting events and sporting conditions, and highlighted the sports of lure coursing, dock diving, and protection dogs. Leading experts in these fields presented the lectures and demonstrations. Additional topics included behavior issues of performance dogs, exercise physiology of the canine athlete, gait evaluation, and arthritis recognition, treatment, and prevention. Laboratories were held to allow participants to learn about behavior training aids, assessment of cardiovascular parameters for dogs in training, gait evaluation, and assessment and treatment for arthritis. A highlight of the conference was the reception, cornhole tournament, and silent auction to benefit sports medicine research. The following is an excerpt from one of the presentations.

**Canine Osteoarthritis: Recognition, Treatment, Prevention**

Marti Drum, DVM, PhD, DACVS

Osteoarthritis (OA) is a disease characterized by joint pain and swelling, reduced range of motion, decreased functional mobility, and variable degrees of local inflammation of the joint structures. Osteoarthritis occurs when injury or cellular damage disrupts the normal homeostasis of the joint, releasing inflammatory mediators and degradative enzymes in a recurring degenerative cycle. It is well known that OA is a common problem in cats and dogs, and is the most common cause of chronic pain in dogs. The most recent estimate is that 20 to 60% of dogs have OA. This number may increase in dogs > 10 years of age.

Joints are composed of articular cartilage, subchondral bone, synovium (joint capsule) and supporting muscles, ligaments and tendons. Chondrocytes produce collagen and proteoglycan that are continuously modified by degradative enzymes. Collagen fibrils and proteoglycans provide structural support and compressive stiffness. Injury to the joint causes a vicious cycle of pain and inflammation. Hip or elbow dysplasia and cranial cruciate ligament rupture are common conditions leading to OA.

**Recognition of Osteoarthritis in Dogs**

Early recognition of OA can be difficult. Dogs have a great ability to conceal pain and lameness, particularly during activities where drive and motivation are strong. Particularly in performance dogs, it can be difficult to determine if performance related issues are due to tendon/ligament injuries or OA. Classic signs of OA include:

- Reluctance to walk, trot, run, jump or play
- Difficulty ascending or descending stairs
- Lameness of one or more limbs
- Stiffness, particularly after rest or in the mornings
- Soreness when touched
- Personality changes or aggression to other dogs or people
- Grunting/groaning when lying down or rising

More subtle signs can be difficult to detect. A standing exam can be very useful to determine if a dog is shifting weight off of a limb. Position changes (“pointing” with one foot, holding a limb toward or away from the body, etc) are often the first signs of a problem in young, exuberant dogs. Hesitation to perform specific tasks, such as repetitive sitting or jumping, can be blamed on lapses in training or possibly a behavioral issue, but may be subtle, early signs of joint problems. Many breeders and sports/performance kennels screen for early OA. One of the most common screening tools is Orthopedic Foundation for Animals (OFA) certification(s) of the hips, elbows, shoulders, or patellas. PennHip evaluations are another screening tool for hip dysplasia. PennHip scoring can be done as early as 6 weeks. Preliminary OFA evaluations can be done prior to 24 months of age. Other routine radiographs may also be used for screening.

**Treatment Options**

There is no cure for osteoarthritis. Although changes have already occurred to the joint(s), many treatment options are available. Because of the chronic nature of this condition, careful follow-up evaluations and altering treatments must be performed on a regular basis.

The management of osteoarthritis is complex, but the main goal is to provide maximum benefit to patients to help restore function to the fullest extent possible and to reduce the pain and discomfort of this chronic condition.

**Dietary Management**

Optimal body weight helps to reduce the progression of arthritis and reduce the symptoms of OA. Weight loss is THE MOST important factor in managing OA. The arthritic dog should be kept on the lean side of optimal condition (4.4-5/9 body condition score) to reduce loading on the joints. Patients should be monitored closely during weight loss programs to avoid loss of muscle mass. In addition, several prescription diets containing omega-3 fatty acids are available to help reduce the inflammation and pain of OA.

**Non-steroidal anti-inflammatory drugs (NSAIDs)**

A variety of NSAIDs are approved for use in dogs, including deracoxib (Deramaxx), carprofen (Rimadyl), meloxicam (Metacam), and firocoxib (Previcox). Because dogs respond differently to various medications, trial courses of medications may be needed to determine (Continued on p. 4 )
which works best. NEVER, EVER combine NSAIDs with each other, or administer aspirin or steroids with NSAIDs. Also, NEVER, EVER administer human anti-inflammatory medication to dogs. The metabolism of these drugs differ between dogs and humans, and may result in serious illness or death. Although NSAIDs designed for use in dogs are generally safe, all medications have the potential for adverse reactions, including vomiting, diarrhea, and loss of appetite. Less commonly, gastric ulceration, liver enzyme elevation, renal dysfunction or liver disease can occur. It is important to assess for any underlying disease conditions before initiating chronic NSAID therapy. These tests include a physical examination, complete blood count, serum biochemistry profile, and urinalysis. Re-evaluation is recommended at regular intervals.

**Other Analgesic Medications**

Recently, a variety of other medications have been used for OA to block pain. These medications include acetaminophen (Tylenol-type drugs – CAUTION - these should never be used in cats), codeine, tramadol, gabapentin, and amantadine. However, recent studies have found that tramadol, when used alone, may have little effect on weight bearing in dogs with OA.

**Structure Modifying Osteoarthritic Agents**

These compounds may help modify the destructive processes of OA and have a positive benefit to cartilage. In general, these agents have a slower onset of activity, but it is hoped that they will slow the process of cartilage destruction. In general, these agents have few adverse reactions.

Adequan - is approved by the FDA for the management of OA. It is an injectable form of polysulfated glycosaminoglycan that has been used to help improve the health of articular cartilage, reduce the destructive enzymes, and improve function in dogs.

Avocado Soybean Unsaponifiables (ASU) – ASUs are a relatively recent nutritional supplement that has shown benefit in humans with OA. ASUs are derived from avocado and soybean oil.

Glucosamine and Chondroitin Sulfate - these substances act synergistically to improve the environment in joints and may modify the course of osteoarthritis. The most recent research in people suggests Glucosamine and Chondroitin sulfate may not control pain of OA, but may provide chondroprotection.

Hyaluronic Acid - HA is found in synovial fluid and the cartilage matrix. Injection of HA into arthritic joints may help improve the cartilage environment and provide some pain relief.

**Physical Modalities to Manage OA**

Recently, physical modalities have been used to manage the symptoms of OA, and to improve function, particularly muscle strength, flexibility, range of motion, and endurance. Some of the modalities include:

- **Heat** - may be soothing, relieve muscle tension, and increase flexibility of joint capsules and tendons to help improve range of motion. It may not be advisable, to apply heat to arthritic joints that have an acute flare-up.

- **Cryotherapy** - the application of cold, may be soothing to joints, provide analgesia, reduce inflammation, and may decrease some of the destructive enzymatic processes occurring in OA.

- **Range of Motion and Stretching** - chronic OA often results in diminished joint range of motion and stiffness. Proper range of motion and stretching exercises can help improve flexibility and joint function.

- **Therapeutic exercises** - as a result of arthritic pain, many patients limit their activity level, resulting in weight gain, decreased cardiovascular performance, muscle weakness, increased stiffness, and decreased joint range of motion. A well-designed therapeutic exercise program helps to restore or improve function in arthritic patients.

- **Aquatic exercise** - aquatic exercise takes advantage of the buoyant properties of water to reduce weight-bearing on painful, arthritic joints. The resistance that water provides encourages muscle strengthening. Arthritic patients greatly benefit from aquatic exercise because weight-bearing can be reduced as much as 60%.

- **TENS** - transcutaneous electrical nerve stimulation is a form of electrical stimulation that may be applied around arthritic joints to reduce pain. This treatment helps improve comfort by flooding the spinal cord with many low intensity signals that help prevent the transmission of pain signals.

- **Extracorporeal Shock Wave Treatment** – ESWT uses high-energy acoustic waves to stimulate growth factor release from target tissues. A clinical study indicated that patients with severe OA of the hip or elbow received a benefit equivalent to that of most NSAIDs.

- **Therapeutic Laser** - laser energy has been used in some arthritic patients with benefit. Although research data regarding OA treatment is lacking in animals, anecdotal reports suggest that some patients may benefit.

**Regenerative Medicine**

Regenerative Medicine Products (Autogenous Stem Cells, Platelet Rich Plasma, Interleukin Receptor Antagonist Protein) are a new concept in veterinary medicine that uses the dog’s own blood or tissues to assist with healing. Autogenous stem cells are harvested from the subcutaneous fat or bone marrow of the patient, under general anesthesia, that is then processed to remove fat cells or increase bone marrow cell numbers. The stem cells are injected into arthritic joints under aseptic conditions. Regenerative medicine therapies seem to “reset” the inflammatory pathways to a more favorable environment. This is accomplished mainly through growth factor release and paracrine effects within the joint.

Platelet-rich Plasma (PRP) uses the patient’s own blood to harvest plasma with high concentrations of platelets, which are rich in growth factors. This form of regenerative medicine is less expensive and a new form of PRP processing at the CARES center has shown great promise.

**All of the above treatments and more, are available at the CARES Center at UT Veterinary Medical Center**
Research Spotlight:
News from the VOL Lab

Members of the Veterinary Orthopedic Laboratory (VOL Lab) presented their research findings at the World Small Animal Veterinary Association Meeting in Cape Town, South Africa.

Drs. Millis, Tichenor, and Hecht presented their research, Prevalence of Osteoarthritis in Dogs Undergoing Routine Dental Prophylaxis, in which they found that 60% of dogs undergoing dentals had one or more joints with radiographic OA. Most owners did not realize that their dog had OA. Therefore, an optimal time to screen for OA may be during dental procedures because dogs can be evaluated and radiographs obtained.

A poster, The Prevalence Of Musculoskeletal Conditions In Service And Working Dogs, was presented by Drs. Millis, Drum, Tobias, and Henderson. Drs. Henderson, Millis, and Hecht also presented a poster, Lumbar Paraspinal Muscle Cross-Sectional Area And Symmetry For Dogs With And Without Degenerative Lumbosacral Stenosis.

Recruitment for New Study

The VOL Laboratory is recruiting dogs for a new study of weight loss in overweight dogs, using caloric restriction and different levels of exercise. Owners will track activity of their dogs using new technology, while providing exercise and a weight loss diet. Owners will receive all study procedures for free, as well as a commercial weight loss diet. In addition, after dogs complete the study, an honorarium will be provided. Owners will be required to bring their dog twice weekly for supervised exercise, as well as provide exercise at home. For further information, contact Tammy Moyers, LVT at 865-974-8387.

End of Year Ideas

As 2014 draws to a close and the holiday season is upon us, the CARES Center for Veterinary Sports Medicine has a few suggestions in the spirit of giving for our furry friends.

For those difficult-to-buy-for dog-owning family and friends, why not consider a 5-pack of aquatic sessions at the UT Physical Rehabilitation Center?

There are also areas of need to improve the quality of life for our CARES patients.

- Padded cage mats
- Updates to motion analysis equipment in the Veterinary Orthopedic Laboratory
- Instrumented treadmill
- Diagnostic ultrasound
- Physioball storage rack
- Doggles (goggles for dogs during laser treatment)

Of course, donations to the CARES Research Fund are always welcome to help provide solutions to issues of working, sporting and rehabilitation patients.

If you are able to help with any of these needs, please contact:

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TREATMENT SPOTLIGHT:
HYPERBARIC OXYGEN

Most people are aware that many dogs like to swim, but a hyperbaric oxygen chamber for diving dogs? Not likely, but there are many other indications for hyperbaric oxygen treatment at the University of Tennessee CARES Center for Veterinary Sports Medicine.

The most common conditions that the hyperbaric chamber is used for include infections of skin and bone, severe wounds with tissue compromise, snake and spider bites, pancreatitis, and carbon monoxide poisoning. Other conditions may also benefit from hyperbaric oxygen treatment.

In general, dogs receive two treatments per day. The chamber is pressurized over a 15 minute period, followed by maintained pressure for 30 minutes, and then dogs “surface” for 15 minutes.

For more information, contact the CARES Center.
In addition, a temporary screw was placed between the radius and ulna to maintain the radial head in the proper position in the elbow joint. In nonworking dogs, the screw is sometimes left in place. However, because working dogs require complete motion of the elbow joint to achieve full function, the screw is usually removed.

Anika began rehabilitation two weeks after surgery to improve joint motion and weightbearing. Although she showed steady progress, she was still not functioning normally. The screw between the ulna and radius was removed approximately 4 weeks after surgery, and rehabilitation was increased. Anika’s progress was followed by assessing joint range of motion and weight-bearing on the force platform in the VOL lab. After 12 weeks, Anika was bearing weight on the limb very well with normal range of motion, and was beginning to return to training and conditioning in preparation for her next assignment.

Anika is an excellent example of returning a valuable working dog to function through the combined efforts of the team of orthopedic surgeons, rehabilitation specialists, and the owners.

For more information, visit www.vetmed.tennessee.edu/CARES.