

Rehabilitation of the Canine and Equine Patient

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Why is Rehabilitation a Growing Area in Veterinary Medicine?

The pet industry is growing; more people own pets than ever before, and they are willing to spend money to keep their pets healthy longer. For most people, pets are members of the family. In the United States in the year 2006, there were 6.9 million horses, 68.7 million households with pets, and owners spent 9 billion dollars on dogs and cats and over 4 billion dollars on horses. As a result, the demand for rehabilitation medicine is being driven by pet owners seeking alternative care.

History and Regulations

The human model for physical therapy that we are familiar with primarily started during World War I when reconstruction aides worked to assist in the rehabilitation of wounded veterans. The APTA (American Physical Therapy Association) was established shortly after the war ended. Physical therapists were in great demand during the poliomyelitis epidemic of the 1940's and 50's. Musculoskeletal physical therapy was developed extensively during this time. Currently, there are 15-20 areas of specialization within the discipline of physical therapy. Examples of these are acute care, hand rehabilitation, cardiovascular/respiratory, oncology, and of course, orthopedics. In 1967, Sir Charles Strong, PT, published a book on therapy for horses. In 1978, Ann Downer, PT, published *Physical Therapy for Animals: Selected Techniques*. In 1980, Jack Meagher published a book geared primarily toward equine physical therapy. In 1996 and 2001 the AVMA developed guidelines for alternative and complementary veterinary medicine.

State law identifies a great difference between veterinary rehabilitation and physical therapy. In veterinary medicine, we call it rehabilitation medicine. In the human world it can be called "physical therapy." The term "physical therapy" is protect by law and cannot be used by anyone other than a licensed human physical therapist. In veterinary medicine there is a Practice Act Law for every state. That law determines whether or not an individual can perform or offer physical therapy or rehabilitation medicine on animals or humans. In some states a human physical therapist can work on either animals or people. In other states, they are restricted to one or the other. Before venturing into the field of rehabilitation medicine, one has to be well-versed in their state's Practice Act Law.

Physical therapy is the science of the application of biomechanics, physics, anatomy, physiology and psychology to persons with dysfunction, injury, pain, or physical abnormalities. The AVMA (American Veterinary Medical Association) and the APTA joined together to bring "physical therapy" to the veterinary community. They continue to work together to advance rehabilitation medicine, which is now only about 8 years old in the veterinary community. The important thing to note as we move forward in the presentation is that rehabilitation medicine is not part of a veterinarian's education or training. The University of Minnesota is the first

veterinary school in the nation to offer a rehabilitation medicine rotation to its senior students. There continues to be some controversy or conflict between the AVMA and the APTA with regard to who exactly should be doing rehabilitation on animals. Physical therapists have an in-depth education in anatomy and physiology and kinesiology with regard to the human. However, even when certified as a canine or equine practitioner they have minimal to no non-human anatomy. On the other side, veterinarian technicians have extensive training in anatomy, physiology, with regard to the animal, but they have no training with regard to the therapeutic manipulation of muscle, tendon, and ligament repair which can return an animal to normal function. The bottom line is the physical therapists think that this should only be in their field, and the veterinarians think it should be in their field. So, there is an international committee working together to keep the two organizations working hand in hand to move this new area of medicine forward.

Rehabilitation is the controlled manipulation of specific muscle groups with the intent to improve function and the quality of movement; to reduce pain, swelling, and complications; to increase strength and range-of-motion; to increase the rate of recovery; to improve psychological health for both the animal and the owner; and generate an improved and prolonged quality of life.

Goals and Benefits

The goals of rehabilitation in the early phase of care are to reduce inflammation, reduce muscle atrophy, prevent contracture, and reduce pain. Many of these conditions are the result of immobilization following injury, surgery, or advanced aging. In the later phase, its goals are to challenge the healing tissues and optimize strength and repair which leads to function. The effect of immobilization on body tissue is the main problem in returning an animal to function. Restricted motion causes atrophy in the cartilage because movement through the range of motion is what maintains synovial fluid in joints. Ligaments and tendons lose their mechanical properties which can take up to a year to rehab and return to function.

There is no recipe for the rehabilitation of patients. There is, however, an approach because you cannot conform a patient to a protocol. The rehabilitation practitioner looks at functional recovery rather than the surgical recovery which is bone and/or wound healing. The practitioner's approach begins with an evaluation that includes a medical and surgical history, current medications, a physical exam and gait analysis, and a review of the home environment and the owner's expectations. Basically what we do is look at the dog's conformation and physical structure. This means the bone structure of the dog, the job of the breed, the musculature of the dog, including the muscle tone, the muscle size (which varies with age and injury), the muscle difference from left to right, and the areas of compensation.

Compensation is the biggest factor when determining a recovery program. Because dogs and horses are quadrupeds, they have the ability to compensate by shifting their weight to optimize their ability to ambulate, regardless of injury. The effect of compensation is seen in kyphotic posture, C-curve posture, two-legged standing, and the Arnold Schwarzenegger effect (large muscle mass in the front limbs and shoulders as opposed to tiny muscle in the rear end). This is a result of the dog's ability to transfer 60% of its weight forward when recovering from rear-end or spinal injury or surgery. Once an animal learns to compensate and is comfortable with its movement, it can be extremely difficult to correct. Dogs that have

been in pain a period of time before surgery have been compensating long before it's noticeable to the average owner. Because animals remember pain, even if the surgery area is completely healed, some dogs will continue to ambulate in the compensating position; they don't trust the injured area, they remember it as painful, and they have lost all muscle mass in that area. So, to a certain extent, it becomes the chicken and the egg concept. The animal is injured, it loses muscle mass, the injury heals, but the animal still can't function normally. The cause isn't the original injury; it's the lack of strength. The practitioner's goal becomes one of building strength as well as correcting the compensatory posture. When a dog compensates, it affects its form; the form affects its ability to function. Function follows form. The ability to function or perform is based on the animal's conformation in combination with physical strength and conditioning. In order to bring an animal back to functional recovery there has to be a planned schedule tailored to each animal. The intensity (degree of effort, both mental and physical), duration (the length of time) and frequency (variable based on the intensity) are determined by the animal's injury, surgery, medical condition, compensatory movement, the owner's ability to work with the animal, and the home environment.

Rehabilitation involves convincing an animal to perform a selected set of exercises. The well-trained animal is by far easier to work with. The average dog has minimal obedience training and is frequently "in charge" in the home environment. These factors can be obstacles in the recovery process and need to be taken into consideration when looking at the intensity, duration, and frequency of a rehab program.

Modalities

The modalities that are used in rehabilitation medicine include: physical agents, manual therapies, aquatic therapies, therapeutic exercises, and functional activities. Cryotherapy, or cold therapy, initially constricts blood vessels and reduces blood flow which helps to control edema, hemorrhage and pain. The therapeutic effects of cold occur at tissue temperatures between 15 -19 C. (59-66 F) Cold is effective from 1-4 cm. deep depending on the degree of adipose tissue and blood supply. Early cryotherapy allows patients to return to full activities sooner than late cryotherapy or early heat. Early phase post-trauma treatment is within the first 24-48 hours.

Heat therapy is a valuable modality and its primary effect is an increase in local blood flow. The increase of heat affects local metabolism resulting in improved oxygenation and toxin removal. Heat increases tissue extensibility, especially of tendon, ligament, and joint capsules and is also recognized to decrease pain sensation. Therapeutic temperature is approximately 40-45 C. (101-105 F). Higher temperatures can cause tissue damage. 15-30 minutes is required to elevate tissue temperature into the therapeutic range.

Therapeutic ultrasound as a treatment modality affects the cellular level of tissue. It is a form of acoustic energy that causes the tissue to absorb pressure waves, resulting in a transfer of energy, acts as a deep-tissue heating agent, and is used to treat musculo-skeletal injuries. It can produce temperature changes as deep as 1-5 cm. in underlying tissues without excessively heating the skin. As a result, it is the most dangerous piece of equipment available to the general public. The effects of the therapeutic ultrasound are thermal and non-thermal. Thermal reduces muscle spasm, increases blood flow, and increases the elasticity of structures like scar tissue. Non-thermal stimulates cell behavior and activity. There are two

modes of operation: pulsed, which causes minimal heating and is used for acute or recent injury; and continuous, which will heat tissue 1-5 cm. in depth.

A therapeutic laser is basically an apparatus to alter light to increase its speed and energy so it will have the power to penetrate the skin. Laser therapy interacts with tissue. This includes hemoglobin in the blood, melanin in the skin, and water in all tissue. The exact cell reactions and the mechanisms of healing are not yet totally clear. The penetration of the light photons stimulates cells throughout all tissue. The photo stimulation increases the rate of collagen synthesis and ATP, which is the transporter of chemical energy in a cell. Activated cells allow tendons, ligaments, bones, and muscles to heal at an accelerated rate. It stimulates the nerves and the remodeling of scar tissue. There are two types of lasers: cold lasers and hot lasers. Cold lasers are low level; they do not heat, but they do impact metabolism and the circulation of lymph flow as well as pain control, acupuncture points, and wound healing. They are completely noninvasive. Hot lasers, on the other hand, cause thermal changes in tissue and are primarily used surgically.

Shockwave is physical energy in the form of controlled acoustic pressure waves. Compressed air is used in a hand piece to generate energy. There is a burst of compressed air, and the impact is transformed into shockwave energy which is transmitted through a probe. Some practitioners think that this is the best non-surgical tool available for the treatment of tendonopathies. Shockwave has been in use in the equine rehab area for a much longer time than in canine. The use of shockwave to treat tendonopathies and tarsal fusion in horses has been its primary use and more recently the treatment of the kissing spine syndrome. In canine rehab the shockwave remains more controversial, especially in the area of CHD and bone healing, however its use for the treatment of biceps tendonitis, supraspinatus and infraspinatus tendonopathy and or mineralization and lateral and collateral ligament injuries is proving to be a more non – invasive approach than surgery.

E-stim or NMES, neuromuscular electrical stimulation, is used to stimulate peripheral motor nerves and denervated muscle. Physiological effects are the recruitment of fast twitch fibers before slow twitch fibers. Muscle atrophy is a big factor when dealing with IVDD, FCE and injuries that cause muscle wasting. The goal is to maintain and or build muscle in the absence of normal nerve function. The use of e-stim in the equine requires a significant knowledge of the temperament of the animal and frequently the use of sedation.

Manual therapy which includes massage, passive joint range of motion, stretching, joint mobilization are of primary importance to the rehab practitioner because these are the therapies that maintain tissue integrity and mobility, minimize the effects of immobilization. Active range of motion will accomplish the same goals as PROM with the added benefits that result from the active contraction of muscle. The manual therapies can also be used to assess progress.

Therapeutic exercises and functional activities are compatible with manual therapies. Front-end strengthening involves the use of limb-lifts, wobble boards, physioballs, cavaletti, incline/decline/diagonal-hill work, and controlled slow walking. Rear-end strengthening exercises use sit-to-stand, down-to-stand, cavaletti with weights, reverse walking, stair climbing, dancing, land treadmill, and physioballs. Core strengthening uses physioballs, diagonal-limb lifting, wobble board, side-lying sit-ups, and abduction and adduction exercises

with and without weights. With both manual therapy and therapeutic exercises it is crucial that the practitioner be flexible and creative in matching the treatment to the dog.

Aquatic therapy, especially the underwater treadmill and Aqua Pacer, can provide up to 80% of the practitioner's caseload. Aquatic therapy benefits the muscle activity without joint concussion, assists with balance, and enhances proprioception. Aquatic therapy allows active muscle contraction with minimal weight bearing on joints and bones. The peripheral and cardiac muscles may be strengthened. Extension and flexion range of motion may be adjusted; and hydrostatic pressure increases circulation. Recovery from injury is faster and stronger. Swimming is an excellent activity for improving endurance and active range of motion. The caution with swimming in both canine and equine is that if introduced too early in the recovery phase, it is possible to damage the surgical repair. All breeds of dogs swim differently. Labradors and other water retriever breeds, for example, may not use their rear limbs when swimming unless they are in a very big hurry. Depending on the density of muscle mass, some breeds swim in a vertical position and or just simply sink. Assisted swimming with a dog recovering from a ventral slot surgery can be beneficial because the dog's initial movements are somewhat spastic, yet when the dog is assisted, it can actually have limb movement and maintain muscle. The Aqua Pacer is the newest underwater treadmill in the equine rehab area, and as in canine, we are able to return horses to work much sooner. Equine rehab also uses long reining, European-style electric walkers and prescribed riding regimes.

Acupuncture has been practiced successfully in the Orient for thousands of years. It is used to treat many conditions in humans and animals. In the Western world, acupuncture gained acceptance by the AVMA in 1988 as a valid veterinary modality. The World Health Organization has formally proclaimed that acupuncture is an effective medical treatment. Simply defined, acupuncture affects a flow of energy or *Chi* that flows through twelve main courses or meridians throughout the body. This energy composes negative or *yin* components and positive or *yang* components. Selected acupuncture points along the meridians can be stimulated to restore the normal energy flow and, therefore, regulate bodily functions. Because the traditional Chinese medicine approach is different but in no way antagonistic to the Western approach of treatment, a well-planned combination of the two therapies complement each other and provide a powerful treatment to bring animals back to full health.

Massage is an ancient art. It is the purposeful manipulation of muscle to increase range of motion, elasticity and circulation. Massage also promotes the creation and circulation of the body's innate restorative materials. Massage loosens the physical tension that impedes the flow of motion. Massage offers a gentle progressive relief. It can help prolong optimal physical efficiency. The directed muscle manipulation can enhance performance, reduce stress, aid in relaxation and recovery after exercise. It can also decrease fatigue, relieve muscle soreness and pain, and increase flexibility. The techniques of effleurage, petrissage, compression, tapotement, direct pressure, and friction also stimulate acupuncture points. Massage is one of the most long-standing and well-used therapies in the equine performance world.

Meso therapy was originated in France in 1952. This technique was introduced into the United States at the Veterinary Thoracolumbar Spine Seminar at Virginia Equine Imaging in 2002. Meso therapy is a treatment that stimulates the mesoderm of the skin with a series of

injections, typically four to six millimeters into the interdermal layer. A minimum of one to two sessions of meso therapy is performed, generally to assess the horse's response. Meso therapy is effective for a multitude of conditions because it helps reverse the physiology of a condition and stop the pain-spasm cycle. Meso therapy is extremely effective when treating the equine back.

Outcome Assessment

Return to function is the end result of therapy and can be documented by different methods of measuring outcome. Outcome assessment is clinical and medical. The surgery site and the injury are healed. This can be visualized and observed by medical imaging. Functional activity is also observable through gait analysis and with the use of the computerized Force Plate. Muscle mass (using the Gulick II tape measure) and range of motion (using a Goniometer) measurements are quantifiable if taken throughout the course of treatment. Outcome assessment measurements encourage owners to continue therapy.

Case Studies

Demographics: Gabby, 2-year-old female Vizsla-cross, 22 pounds.

Problem: FHO surgery following a malunion of the left femur causing an inappropriate rotation of her leg causing subluxation of her left hip. Her leg length post surgery was 1.5 inches shorter than the right leg.

Therapy: Behavior modification, PROM, land treadmill, therapeutic exercises, weights.

Demographics: Cisco, 6-year-old male neutered Jack Russell terrier, 15 pounds.

Problem: Fractures of his second, third and fourth metacarpals.

Therapy: Land treadmill, therapeutic exercises.

Demographics: Logan, 8-year-old male neutered Gordon setter, 70 pounds.

Problem: Chronic right front lameness, one year duration. Supraspinatus tendonopathy.

Therapy: Shockwave, therapeutic ultrasound, laser, aqua treadmill.

Demographics: Oz, 1-year-old male neutered Golden Retriever, 70 pounds.

Problem: FHO right hip.

Therapy: Therapeutic ultrasound, therapeutic exercises, aqua treadmill, PROM.

Demographics: Sammy, 10-year-old male neutered Whippet, 30 pounds.

Problem: Ventral slot C 6, 7; tetraparetic.

Therapy: PROM, therapeutic exercises.

Demographics: Hank, 11-year-old Warm Blood gelding.

Problem: Severe chronic tenosynovitis of the right forelimb. Adhesions to the proximal fetlock joint. Tenoscopy and annular ligament desmotomy.

Therapy: Therapeutic ultrasound, laser, riding protocol.

Demographics: Godiva, 4-year-old Friesian mare.

Problem: Sciatic ligament enlargement following foaling causing severe muscle atrophy of the left gluteal muscles.

Therapy: Therapeutic ultrasound, E-stim, laser, riding protocol.

Demographics: Willa, 4-year-old Thoroughbred mare.

Problem: Severe laseration to the medial stifle.

Therapy: Laser, Aqua Pacer.

References

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Special thanks to:

John Sherman DVM, Vet Hab, Raleigh, NC

Liz LaFond DVM, Dipl. ACVS,
Director Rehabilitation Services, University of Minnesota Veterinary Medical Center

Cynthia Anderson MS

Barb Guse PT, CCRP