

# Rehabilitation in the First 48 hours after Surgery

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Physical therapy is commonly used postoperatively in humans to decrease pain, inflammation and recovery time. The same goals can be achieved in our veterinary patients using similar modalities such as; cryotherapy, passive range of motion, massage, transcutaneous electrical stimulation and low-level light laser therapy. When used in the first 48 hours following surgery, the reduction in pain, increased mobility, and decreased inflammation will aid in early return to normal function. Applied appropriately these treatments have both immediate and long term benefits.

Clin Tech Small Anim Pract 22:166-170 © 2007 Elsevier Inc. All rights reserved.

**KEYWORDS** cryotherapy, massage, inflammation, range of motion, canine

Physical therapy is widely used in human medicine to ease pain and speed recovery. It is, in most cases, a safe, non-invasive method of treatment that is now becoming more popular and more available in veterinary medicine. Traditionally, veterinarians have been trained to use immobilization devices and techniques after surgery. Discharge instructions included limited leash walking and bicycle movement of the injured limb. However, in human medicine, periods of immobilization can result in severe muscle atrophy (especially in type I fibers), and fibrous contracture can result in the limb.<sup>1</sup> Immobilization is also detrimental to the health of cartilage, ligaments, and bone. Although it may at times be necessary to immobilize the limb, the consequences should be anticipated. Reduced range of motion occurs after a period of joint immobilization and may take 8 to 12 weeks of remobilization for improvement to occur.<sup>2</sup> Early intermittent passive range of motion is now considered the standard of care for postoperative human patients. The same rehabilitation principles apply to small animals. Veterinarians now initiating early range of motion postoperatively are experiencing decreased postinjury and postoperative recovery times in their patients.<sup>1,3</sup>

Surgery results in a number of physiological responses, including inflammation, pain, catabolic changes in tissues, and protection of the operated limb. The side effects of these physiological changes include increased metabolic rate and oxygen demand, inflammatory mediator and cytokine production, peripheral and central nervous system hyperalgesia, tissue catabolism, impaired immune function, ileus, tachycardia, hypertension, and tachypnea.<sup>4</sup> Although many of the effects of inflammation are beneficial in some instances, excessive and/or prolonged inflammatory responses can be det-

perimental and may even be more harmful than the inciting stimulus. Postoperative rehabilitation can aid in decreasing the length and intensity of the adverse effects.

Rehabilitation techniques in our hospital are implemented as the patient is taken from the surgery table. If postoperative radiographs are required, therapy is initiated as the patient is transported and waits in radiology. As the patient recovers from anesthesia, one or a combination of the following treatments may be used: passive range of motion, massage, low-level light laser therapy, electrical stimulation, and cryotherapy. These therapies are continued until the animal is discharged from the hospital with the addition of appropriate therapeutic exercises the day after surgery. Recommendations for at-home therapies and the option to return for rehabilitation on an outpatient basis are given to the client at discharge. Each session is monitored according to the individual patient's needs and changed accordingly.

## Inflammation Following Surgery

To properly and safely apply rehabilitation techniques immediately following a surgical procedure, an understanding of the body's inflammatory response is needed. Injury to tissue initiates a complex series of events involving many cellular and biochemical responses that ultimately result in wound healing. The series of events depends on the severity of the injury and the tissues involved. The goal is regeneration or repair of the injured or traumatized tissue.

During the inflammatory phase of tissue healing, increased permeability of the microvasculature occurs as a result of histamine and bradykinin release. In addition, these chemical mediators cause vasodilatation and increased blood flow to the area. These events, coupled with hypoxic cellular changes, are primary factors in the formation of edema. The immediate vascular component of the response is centered around hemostasis and the result is formation of a fibrin

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**Figure 1** Proper support of the limb during ROM therapy.

network to support the hemostatic plug and to act as a scaffold for cellular infiltration.<sup>4</sup>

The cellular aspect of the inflammatory phase involves neutrophils migrating into the area, beginning by 6 hours after injury and increasing in number over a 2- to 3-day period. Their roll is to provide initial debridement and phagocytosis of microorganisms, minimizing the potential for infection.<sup>4</sup> Macrophages, appearing 24 to 48 hours later, are key in the transition from the inflammatory phase to the reparative phase. They play a central part in phagocytosis, wound debridement, matrix synthesis regulation, cell recruitment and activation, and angiogenesis.<sup>4</sup>

## Range of Motion

The full motion that a joint may be moved through is termed the range of motion.<sup>2</sup> Postoperative patients that do not receive early range of motion exercises, such as those undergoing femoral head ostectomy, may suffer reduced stifle extension, which can be permanent. The benefits of passive range of motion following joint surgery were initially described by Salter and coworkers and included decreased pain and improved rate of recovery.<sup>5</sup> These broad benefits are mediated by prevention of soft-tissue adaptive shortening, maintaining mobility between soft-tissue layers, reduced pain, enhanced blood and lymphatic flow, and improved synovial fluid production and diffusion.<sup>6,7</sup> It is critical, however, that the therapist maintain a range of motion that is comfortable to the patient and not injure tissues by exceeding their anatomic or physiologic limits. Passive range of motion, when done gently, can also work to relax nervous animals.

Treatment should be administered in a quiet and comfortable area, away from distractions, such as loud noises, other pets, and other people who are not helping with the treatment. This establishes an environment that promotes relaxation, allowing the patient to be more receptive to the treatment. Generally the patient is placed in lateral recumbency with the affected limb up. Beginning the session with 2 to 3 minutes of gentle stroking massage may also help with relaxation. The bones proximal and distal to the joint should be supported to avoid excessive stress on the joint (Fig. 1). The therapist should gently grasp the limb and avoid painful ar-

reas, such as incisions and wounds. The motion should be smooth, slow, and steady with movement at the distal aspect of the limb while the proximal limb is held steady. The other joints of the limb should be allowed to remain in a neutral position. Try not to move the other joints while working on the affected joint because some joints may be restricted by the position of the joints above or below the target joint. In these situations, the other joints should be placed in a position that will allow as complete a range of motion as possible to the target joint. For example, maximal hock flexion cannot be obtained while the stifle is maintained in an extended position. In this case, placing the stifle in a flexed position allows more complete flexion of the hock. Slowly continue to flex the joint until the patient shows initial signs of discomfort, such as tensing the limb, moving, vocalizing, turning the head toward the therapist, or trying to pull away. With the hands maintained in the same positions, slowly extend the joint. Again, try to keep the other joints in a neutral position and minimize any movement of the other joints. The patient should be continually monitored for any discomfort and the technique altered if necessary to enhance comfort.<sup>2</sup>

After completing range of motion of the affected joint, keep the limb in a neutral position and slowly move the hands distally to the digits (or if already working on the digits, move proximally). Range of motion exercises are then performed on the other joints of the limb. For example, begin with the digits; proceed to the tarsus, stifle, and last, the hip. It is important to fully flex and extend each joint. The number of range of motion repetitions and the frequency of the treatments depend on the condition treated. In general, for most routine postoperative conditions, 15 to 20 repetitions performed two to four times per day is likely to be adequate. We often end the range of motion session with a gentle massage to the injured limb for approximately 5 minutes. Massage will help to maintain a relaxed state.

Passive range of motion is contraindicated when motion may result in further injury or instability, such as unstable fractures near joints and some ligamentous or tendon injuries. These exercises should also be omitted or limited in patients with joint hypermotility (luxation), osteopenic bones, or recent skin grafts.<sup>1</sup>

## Massage

Massage is the gentle manipulation of muscles and soft tissues. Using the hands to manipulate soft tissue can enhance circulation, reduce edema, loosen and stretch tendons, and minimize scar tissue formation. Massage also soothes anxious and uncomfortable patients and is often used before the patient undergoes other forms of rehabilitation.<sup>1,6</sup> The mechanical effects of massage also increase nutrient delivery and waste removal from various tissues.<sup>8</sup>

Endless variations on massage exist; some of the common techniques include the following: stroking, effleurage, petrissage, shaking, vibration, friction, and tapotements. Sessions are often initiated and concluded with stroking. Stroking movements are performed in a relaxed manner using very lightly the tips of your fingers or the palm of the hand. While this technique can be performed in any direction, it usually follows the length of the muscles. When done slowly, the result is a calm patient.

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