

## **Rehabilitation after Cranial Cruciate Ligament Stabilisation**

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The surgical stabilisation of the cranial cruciate ligament-deficient (CrCL-deficient) stifle joint is the most common surgical procedure performed in canine orthopaedics. Physical rehabilitation is often discussed as adjunctive therapy after surgical stabilisation of the CrCL-deficient stifle. Only a few studies have assessed the impact of physical rehabilitation on limb use in dog undergoing CrCL stabilisation.<sup>1-3</sup> For logistical reasons, these studies are short-term studies, including relatively small dog groups followed-up for weeks to months rather than years. These studies generally include all dogs undergoing surgery rather than subgroups of dogs stratified based on specific profile or functional impairment. Also, studies often focus on one specific rehabilitation step (eg, aquatic therapy, cold therapy, neuromuscular electrical stimulation) rather than an overall rehabilitation plan.<sup>1,2,4</sup> Overall, the published research unfortunately does not allow clinicians to unequivocally tell owners that rehabilitation is necessary after the surgical stabilisation of the CrCL-deficient stifle in dogs. The purpose of this presentation is to discuss rehabilitation steps that could benefit dogs undergoing stabilisation procedures of the CrCL-deficient stifle and to discuss factors present in dogs with CrCL-deficient stifle joints that might warrant specific rehabilitation therapy.

### **Pathophysiology of the CrCL-deficient Stifle Joint**

Limb **disuse** is the most obvious consequence of CrCL disease. Limb disuse is common in dogs with chronic CrCL deficiency. Limb disuse is complex process induced by the chronic pain originating in the stifle region. With disuse, there is a loss of muscle mass, bone mass, cartilage thickness and stiffness, and ligament strength. Dogs with CrCL disease shift weight away from affected limbs to minimise the loads resisted by affected stifle joints. If the opposite CrCL is intact, CrCL-deficient dogs shift weight to the opposite pelvic limb when standing and walking; otherwise, CrCL-deficient dogs shift weight forward, balancing most of their weight on their forelimbs when standing and walking. These changes in posture develop over weeks of chronic pain and become part of the dog's demeanor.

CrCL disease is often chronic when diagnosed or managed. With **chronicity**, limb disuse is deeply rooted into a dog's demeanor, local pain amplification and spinal cord wind-up occur, osteoarthritis progresses, damage to the medial meniscus is more likely, and articular or periarticular fibrosis develops.

In Labrador Retriever, the mean **motion of the stifle** joint reportedly is 42 to 162°. <sup>5</sup> Even though, the changes in joint motion present in stifle joints with chronic CrCL deficiency have been reported, a loss of stifle joint motion appears common and is the likely consequence of articular or periarticular fibrosis. Torsional instability (ie, excessive internal rotation of the tibia) is sometimes present in dogs and may be a component of the pathogenesis of CrCL injury. Joints with torsional instability are sometimes torsionally unstable when dogs are weight bearing, an event named pivot shift. Just like cranial tibial thrust, pivot shift is not weight tolerated. It may lead to meniscal damage, chronic synovitis, and limb disuse.

### **Physical Rehabilitation Steps to Consider for CrCL-deficient Dogs**

Cruciate ligament disease in dogs is often a source of severe acute and chronic **pain**. Specific aspects of cruciate ligament disease include synovitis, cranial tibial thrust during the stance phase, joint effusion, osteoarthritis, tearing and folding of the medial meniscus, and other changes. While it is clear that pain

is key to the dysfunction experienced by dogs with CrCL-deficient stifle joints, little is known about the relative importance of specific problems associated with cruciate ligament disease on that pain. Several steps included in surgical procedures for CrCL stabilisation alleviate pain. They include the removal of frayed CrCL fibers (themselves a source of inflammation), the removal of torn menisci, and the elimination of cranial tibial thrust. Rehabilitation can alleviate the pain associated with CrCL stabilisation surgery directly, through the use of cold, massage, passive range of motion, transcutaneous electrical nerve stimulation, therapeutic ultrasound, or indirectly, through the increase of joint motion or low-impact exercise.

**Controlling edema** can be achieved using cold therapy, massage, elevation, compression, passive range of motion. Edema is source of pain and a potential trigger of disuse (or lack of return of limb use) in dogs.

Physical rehabilitation promotes proper **limb use**. Peripheral primary sensitisation and allodynia are components of limb disuse. Their control requires sustained pain management and time, once the source of inflammation is eliminated. Physical rehabilitation includes the implementation of therapeutic exercises. In limbs with disuse, therapeutic exercises are done at a stance or at a very low walking speed. The limb is generally rhythmically loaded. This rhythmic loading, sends non-noxious sensory stimuli that decrease chronic pain and promote proprioception. Promoting optimal weight distribution and limb use can only be accomplished after surgical CrCL stabilisation and once pain is managed effectively using pharmacological and non-pharmacological measures.

**Stretching** is a common goal of physical rehabilitation programs after stabilization of CrCL-deficient stifle joints that lack stifle joint motion. At a trot, the motion of the stifle joint is approximately 90 to 145°. <sup>6</sup> A loss of stifle joint extension is more debilitating than a loss of stifle joint flexion because the functional range of motion of the stifle takes the joint closer to full extension (~15°) than full flexion (~50°). Stretching strategies used in rehabilitation include manual stretching, bandaging, braces, and therapeutic exercises. <sup>7</sup>

**Strengthening** is a key component of physical rehabilitation programs because limb disuse and CrCL disease lead to a loss of muscle mass. Strengthening is generally achieved using therapeutic exercises, although it can sometimes be started using neuromuscular electrical stimulation in the most severe patients that cannot be exercised.

### **Implementing rehabilitation after CrCL stabilization**

Physical rehabilitation can deliver a specific assessment of dogs with CrCL-deficient stifle joint, it can provide advice for patient management in the acute, subacute, and chronic phases of recovery, it can provide care throughout recovery, it can implement specific strategies to recover loss of stifle motion or manage limb disuse.

All dogs benefit from a specific preoperative assessment. <sup>8</sup> Most dogs will benefit from a short-term strategy to control edema and initiate postoperative limb use. Some dogs will need specific rehabilitation oversight to recover motion in the stifle joint or promote limb use and proper weight distribution.

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