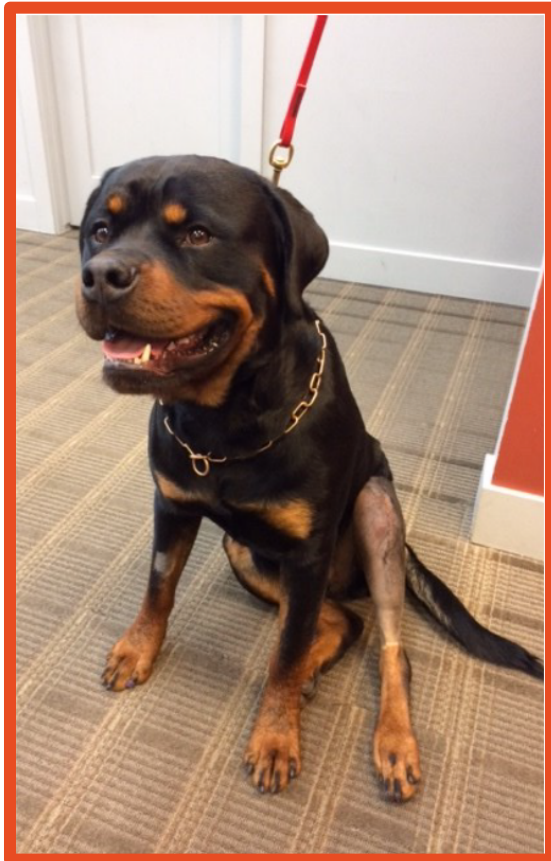


**EARLY REHABILITATION  
FOR POST-OPERATIVE CRUCIATE DEFICIENCY  
RECONSTRUCTION**

# FOUR LEG REHAB NEWS

**ISSUE 11 - VOLUME 2**

**SUMMER / FALL 2022**



Hey!!!

I hope this newsletter finds you well!

This issue of the Four Leg Rehab News is all about Post-CCL Surgical Reconstruction and more specifically EARLY REHABILITATION. It goes through the most current literature on the subject and is meant to be shared!

So, please feel free to download this newsletter and use it as you like in an effort to enhance all veterinary parties about the importance of early rehabilitation in Post-Op Cruciate Cases!

Let's get to it!

Cheers,

Laurie Edge-Hughes

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Firstly, I believe that research should be open access. Here are the main references I used, and links to find them online.

**Alvarez LX, Repac JA, Kirkby Shaw K, Compton N. Systematic review of postoperative rehabilitation interventions after cranial cruciate ligament surgery in dogs. Vet Surg. 2022 Feb;51(2):233-243.**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9303706/>

**Kirkby Shaw K, Alvarez L, Foster SA, Tomlinson JE, Shaw AJ, Pozzi A. Fundamental principles of rehabilitation and musculoskeletal tissue healing. Vet Surg. 2020 Jan;49(1):22-32.**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6973127/>

**Eiermann J, Kirkby-Shaw K, Evans RB, Knell SC, Kowaleski MP, Schmierer PA, Bergh MS, Bleedorn J, Cuddy LC, Kieves NR, Lotsikas P, Pozzi A. Recommendations for rehabilitation after surgical treatment of cranial cruciate ligament disease in dogs: A 2017 survey of veterinary practitioners. Vet Surg. 2020 Jan;49(1):80-87.**

<https://sci-hub.hkvisa.net/10.1111/vsu.13294> (Note: This link might not work over time...)

## MAIN FINDINGS

### ALVAREZ, ET AL 2022.

This paper was a systematic review. The first of its kind. So, not only did it analyze the results of other studies (19 studies were able to be reviewed), it further evaluated the risk of bias and study quality.

The majority of these studies supported **EXERCISE THERAPY** for dogs recovering from surgery due to CCL-Deficiency. The studies with the highest level of evidence and lowest risk of bias showed conflicting results for efficacy. Exercise therapies administered varied greatly and consisted of swimming, therapeutic walks, underwater treadmill therapy, and home exercises.

**COLD COMPRESS THERAPY (CCT)** was the only modality to have two supporting studies with low Risk of Bias (and 2 others with higher risk of bias). One study used the “Game Ready” cold compress system and reported support for short-term benefits of CCT; showing lower pain scores, decreased stifle circumference, and increased ROM within the first 24 h. The other study used a CCT device and a gel wrap to deliver cold therapy and compared to a control group. Both CCT interventions found benefit in both short term and long term outcome measures (i.e. pain, range of motion (ROM), lameness scores).

**EXTRACORPOREAL SHOCKWAVE (ESWT)** was evaluated in 3 studies – two looking at bone healing, and one looking at patellar desmitis. All studies evaluated electrohydraulic generator ESWT units. The studies were variable in risk of bias. Results were less thickness in patellar tendons treated with ESWT, and no differences in osteotomy healing at 8 weeks between treated and control groups. However, one of the studies (with a high risk of bias) did find that ESWT-treated dogs had greater peak vertical force (PVF) and vertical impulse (VI).

**PHOTOBIMODULATION (PBM)** was researched in three papers. Two used class 4 lasers and one used a class 2 laser. They were all deemed to have low risk of bias. The class 2 laser study found no significant differences in all outcomes measured. Of the two class 4 laser trials, one found the PVF was greater in the treatment group than the control at 8 weeks, and the other found the PBM group had improved subjective outcomes in gait; with no other differences noted.

One study was included that used **ELECTRICAL MUSCLE STIMULATION (EMS)** was determined to have a high-moderate risk of bias, but found that EMS-treated dogs had larger limb circumference, decreased radiographic OA scores, and lower lameness scores compared to the control group; with no differences seen in ground reaction forces (GRF) and stifle ROM.

**LOW-INTENSITY PULSED ULTRASOUND THERAPY** was studied in one trial with a low risk of bias and found to have no significant impact on radiographic healing and limb function in dogs after TPLO.

## MAIN MESSAGES

### KIRKBY SHAW, ET AL 2020

This paper took a very unique approach, in that it attempted to discuss the main principles that need to be understood and applied to a rehabilitation program for dogs post-CCL-deficiency. As such, the recommendations are theoretical in nature.

**INTRODUCTION:** A standardized approach to postoperative rehabilitation in dogs needs to be adopted for long-term, multicenter, prospective studies to be able to identify factors that improve outcomes. This review discusses four basic principles of rehabilitation and its application to tissue healing specific to cranial cruciate ligament disease.

#### **PRINCIPLE 1: TISSUES FOLLOW A PREDICTABLE PATTERN OF HEALING.**

**Skin** – wounds that are well sutured should achieve epithelization in 24 to 48 hours. If no gap forms, sufficient strength is expected at 10 to 14 days, although maximum strength may never reach 100%.

**Muscle** – according to the amount of gap between fibers and the degree of injury, muscles may require 6 weeks to 6 months to regain strength. The flexibility and susceptibility of reinjury is related to fibrous tissue between healing fibers.

**Tendon, ligament, fascia** – as they are less vascular, healing can take up to a year. The vascularity of the tissue and degree of injury will affect the speed and amount of healing.

**Bone** – generally regains strength in 12 weeks; the rate and type of healing is affected by the patient's age and type of surgical fixation.

#### **PRINCIPLE 2: INDIVIDUALIZED TREATMENT PLANS SHOULD BE DEVELOPED BY THE REHABILITATION THERAPIST AND ADJUSTED AS REQUIRED**

The patients' progress through rehabilitation should be based on assessment of tissue healing, strength, and functional abilities/limitations.

Measurements that can help the therapist to determine healing and function can include the following: Muscle mass (thigh circumference); ROM; Gait scores; Static weight bearing tests; and Functional tests.

## **KIRKBY SHAW, ET AL 2020 (continued...)**

### **PRINCIPLE 3: SPECIFIC, MEASURABLE, ATTAINABLE, AND RELEVANT GOALS SHOULD BE SET FOR EACH REHABILITATION PATIENT.**

Rehabilitation should treat the whole body and be modified throughout the phases of healing.

Here the authors delve into the surgical differences between an extracapsular repair and osteotomy procedures and the things that a therapist need be aware of from a rehabilitation perspective. (i.e. muscle cut through, muscle attachments elevated, location of swelling, anticipated post-operative biomechanics of the stifle, implants.

### **PRINCIPLE 4: VETERINARY PHYSICAL REHABILITATION INCLUDES PAIN MANAGEMENT, THERAPEUTIC EXERCISE, MANUAL THERAPY, AND GUIDED RETURN TO ACTIVITY.**

CCL surgery will result in tissue inflammation and pain; so using modalities, exercise, and manual therapy will encourage earlier return to function.

Post-surgery, the therapist is more likely to be the one to interact with the client and provide guidance for controlled activities and adaptations to the home. It is ideal for rehabilitation to begin immediately after surgery and continue until the patient is back to function.

The definition of normal activity differs for a pet or working/sport dog. Pets can return to full activity after they have shown ability to perform all activities of daily living with normal ROM and clearance from the surgeon. For the working or sport dog, a specific conditioning program is required, focused on the type of tasks, and usually last an additional 8 to 12 weeks.

**CONCLUSION:** General guidelines for rehabilitation after surgery for CCL disease has been provided in this review based on principles of healing and standards of physical therapy. Future clinical trials should be designed with protocols developed based on these guidelines, and therapists are encouraged to follow these principles when developing programs for their patients.

## KEY RESULTS

### EIERMANN, ET AL 2020

**INTRODUCTION:** This study reports on the recommendations for post-surgery rehabilitation by those performing Cranial Cruciate Ligament (CrCL) surgery.

**METHODS:** A survey with questions related to the post-surgery treatments of CrCL disease was distributed to veterinarians that specialized in surgery or rehabilitation.

**RESULTS:** There was a 13% response rate. 55% of these were from North America, 30% were from Europe, 10% were from UK or Ireland, and 5% were from other locations.

- 39% recommended rehabilitation for all their cases and provided their client with contacts, 16% recommended a consultation with a rehabilitation therapist, 23% recommended rehabilitation for specific cases only, 16% recommended informal (home exercises) rehabilitation, and 2% did not recommend any rehabilitation; while 4% chose 'other'.
- Respondents were more likely to recommend rehabilitation for geriatric, sporting or working dogs; as well as for those with muscle atrophy or decreased range of motion.
- The reported obstacles were cost (49%), distance (29%), time (16%). 4% of the respondents did not see benefits from rehabilitation, and 2% reported that their clients did not see benefits of rehabilitation.
- The type of recommendations appear to be based on what surgeons were taught (23%) and what they learned from publications (23%); while 13% learned from conferences; and 12% were certified or took courses in canine rehabilitation. 9% made recommendations out of habit and 20% responded 'other'.
- The majority (92%) stated they would benefit from guidelines for rehabilitation after stifle stabilization for CrCL deficiency.
- Recommending rehabilitation was affected by the type of CrCL surgery in 26% of respondents; more for extracapsular stabilization (17%) than after tibial osteotomy (9%).
- 65% of respondents did not use supportive bandaging or braces, while 19% used it for less than 24 hours after surgery; 11% used it for up to 48 hours, 4% used it up to 7 days, and 1% used it for up to two weeks.
- Most of the respondents used ice packs without compression on the incision (67%) and performed passive range of motion on the affected joint (55%) prior to the dog's discharge.

**CONCLUSION:** More evidence is needed to show the short and long term outcomes of rehabilitation. The majority feel that guidelines on rehabilitation therapy after CrCL surgery would be helpful.

## DIET STUDIES

**Verpaalen VD, Baltzer WI, Smith-Ostrin S, Warnock JJ, Stang B, Ruaux CG. Assessment of the effects of diet and physical rehabilitation on radiographic findings and markers of synovial inflammation in dogs following tibial plateau leveling osteotomy. J Am Vet Med Assoc. 2018 Mar 15;252(6):701-709.**

<https://sci-hub.hkvisa.net/10.2460/javma.252.6.701> (Note: This link might not work over time...)

**INTRODUCTION:** The current study reports on the synovial pro-inflammatory mediator concentrations assessed in the same study; as well as osteoarthritis progression, osteotomy healing time, and incidence of patellar desmitis.

**CONCLUSION:** Feeding an omega-3 fatty acid and protein-enriched food, with or without rehabilitation, may benefit dogs after TPLO and arthroscopy. Lower synovial fluid concentrations and slower progression of osteoarthritis was seen over the study period. Rehabilitation may also slow progression of osteoarthritis and the protocol used did not appear to have negative impacts on recovery variables. Future studies of the effects of diet and rehabilitation post-surgery should include a larger number of dogs and assess different types of joint diseases.

**Baltzer WI, Smith-Ostrin S, Warnock JJ, Ruaux CG. Evaluation of the clinical effects of diet and physical rehabilitation in dogs following tibial plateau leveling osteotomy. J Am Vet Med Assoc. 2018 Mar 15;252(6):686-700.**

<https://sci-hub.hkvisa.net/10.2460/javma.252.6.686> (Note: This link might not work over time...)

**INTRODUCTION:** This study aimed to assess the clinical effects of an omega-3 fatty acid and protein-enriched diet, as well as rehabilitation, over a 6 month period following TPLO for treatment of CCLD.

**CONCLUSION:** The results of this study shows that feeding an omega-3 fatty acid and protein-enriched diet and implementing rehabilitation with underwater treadmills can reduce recovery time of return to function for the affected limb after TPLO and arthroscopy.

## Laurie's Thoughts

### Alvarez et al, 2022

1. It's great there are enough studies to do a systematic review. However, I feel like there needs to be better studies, more studies, and studies that use functional parameters as outcome measures.
2. Of the photobiomodulation studies, I am familiar with them, and sadly, I would have to say that there was an insufficient dose of laser light administered to the tissues. I look forward to more studies that use different laser parameters, and different classes of lasers as well.
3. Of the shockwave studies, it would be nice to see studies done that look at pain management (short term) or function and osteoarthritis parameters in the long term. I'd also love to see a variety of shockwave types studies.
4. Despite the high risk of bias in the electrical muscle stimulation study, I think an increase in thigh circumference and reduced OA scores are a good sign and warrant another study that looks at the same things, but with greater randomization and 'blindedness' of evaluators.

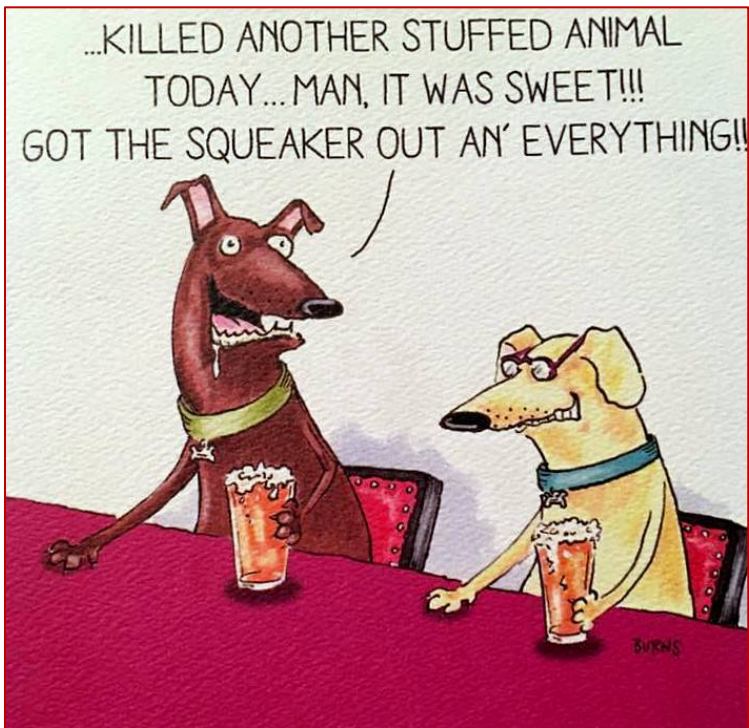
### Kirkby Shaw et al, 2020

5. The Kirkby Shaw paper highlights what rehabilitation professionals / veterinary physiotherapists learn as part of their basic training. I like this paper from the stand point that it highlights what is important to take note of when designing a rehab program. However, I think it falls short in flat out saying, "THIS is the is what people learn when they take the rehabilitation courses."
6. While the paper discusses how rehabilitation needs to be individualized and that the rehabilitation therapist needs to take into account the 4 highlighted principles, it then concludes that a protocol be developed... which is somewhat counter to saying that rehab needs to be individualized.

### Eiermann et al, 2020

7. Sadly, not enough surgeons are bought into rehab. A 13% response rate isn't great. And of those 13% that cared enough to respond, only 55% routinely recommended rehabilitation.
8. 92% of the respondents wanted standardized rehabilitation guidelines, which only proves that they don't really understand rehabilitation and the need for individualization. What they NEED is to refer to professionals with rehabilitation / veterinary physio training.





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