Prevention failed: Rehabilitation of the Stifle

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The Post-Op Stifle

- Ideally, we would prevent CCL disease and the consequences of rupture
- Unfortunately, the majority of dogs with ruptured CCLs are surgical candidates
- PT is the standard of care for humans and ACL injury, resulting in improved function and faster return to athletic activities.

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The Post-Op Stifle

- What about our dogs and CCL disease – do they need rehabilitation?
- Early studies showed outcomes were similar between post op dogs undergoing rehab with a therapist and those with at home exercises

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The Post-Op Stifle

- More recent rehabilitation techniques have produced improved range of motion, reduction of muscle spasms, improved weight bearing and overall joint function
- 50% of canine patients experience contralateral CCL rupture at an average of 58 weeks from first incident.

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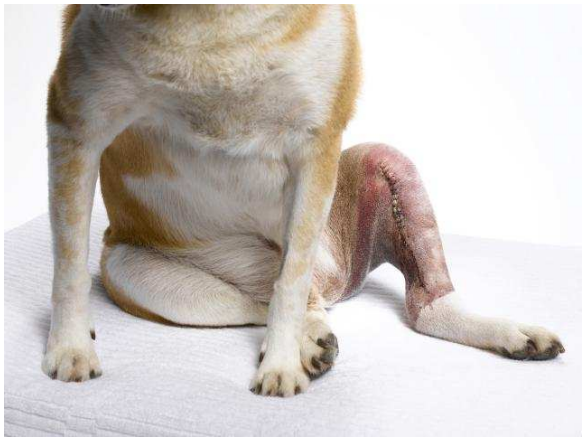
The Post-Op Stifle



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Ligament biology

- 66% of ligament mass is water
- 75% of dry weight is collagen
- 25% proteoglycans, elastin, proteins, glycoproteins
- Type I collagen accounts for 85% of total collagen
- Remaining balance Types III, V, VI, XI, XIV

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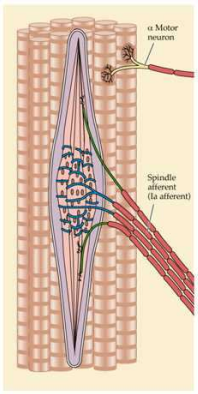
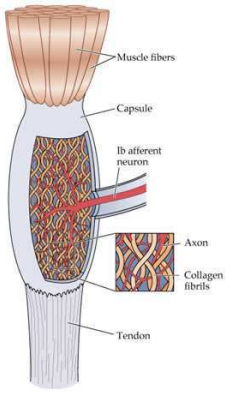
Ligament biology

- Microscopically, bundles of collagen fibers are composed of parallel fibrils
- Highly cross linked, which contributes to strength of the ligament
- Collagen bundles are “crimped” which allows ligament to elongate under load without damage

Ligament biology

- When ligaments are strained, proprioceptive nerves initiate muscle contraction to protect and stabilize the joint





Ligament healing

Normal Ligaments

- bimodal (large) collagen fibrils
- cell and matrix turnover low
- collagen aligned
- collagen densely packed

Ligament Scars

- smaller collagen fibrils
- cell and matrix turnover high
- collagen disorganized
- flaws between fibers

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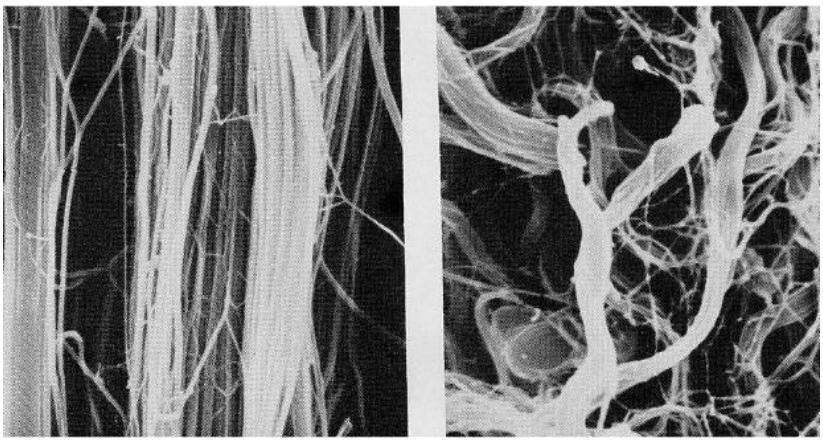
Ligament healing



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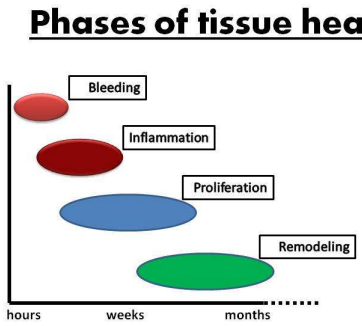
Tendon/Ligament healing



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The Post-Op Stifle

3 general goals of CCL rehabilitation post operatively:

1. **Control pain and inflammation**
2. **Promote range of motion and joint healing**
3. **Increase muscular strength, normalize gait and promote proprioception**

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Drugs

- **Non-Steroidal Anti-inflammatories**
  - **Short term (3-5 days) use for immediate post operative pain**
  - **Long term use may interfere with tendon healing**
  - **Higher potential for gastric ulceration in working dogs**
- **Opioids: tramadol, fentanyl, morphine**
- **Others: amantadine, lidocaine patches, nutraceuticals**

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Cryotherapy

Ice pack/device

Ice massage

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Thermotherapy

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Therapeutic ultrasound

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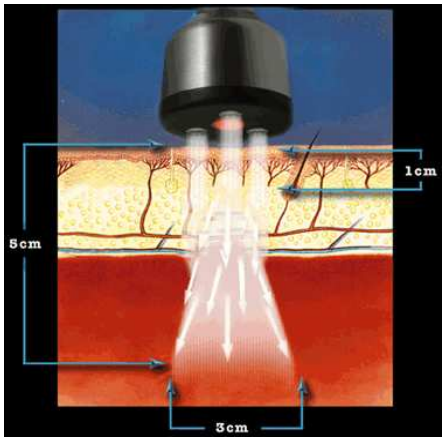
Low Level Laser



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TENS

- **Transmission of small electrical pulses through the skin to the underlying peripheral nerves.**

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Acupuncture

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Manual tissue therapy

- Medical massage
- Myofascial release
- Trigger Point therapy

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The Post-Op Stifle

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Passive Range of Motion

Active ROM

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Controlled exercise

Leash walking

Dry treadmill

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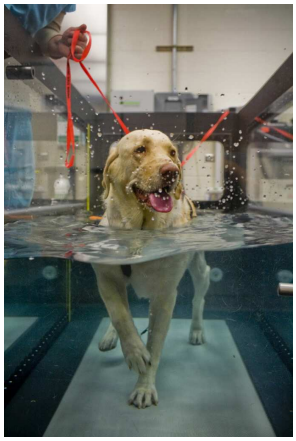
Underwater Treadmill



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Swimming

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Specific exercises

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The Post-Op Stifle

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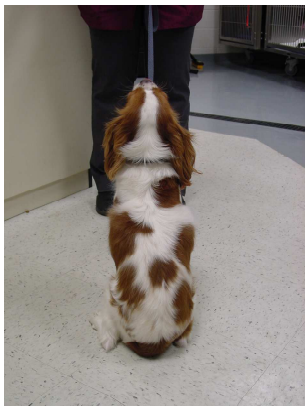
Increase muscle strength



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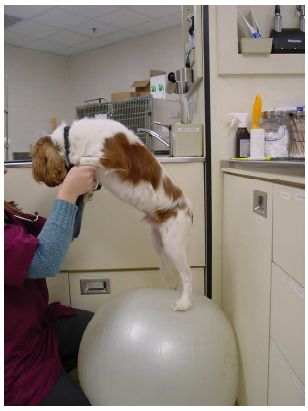
Increase muscle strength



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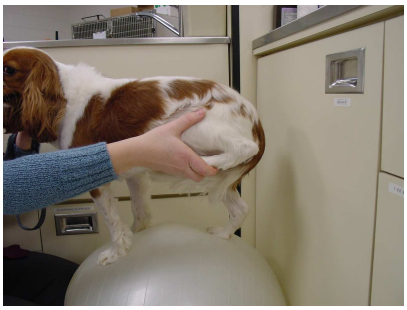
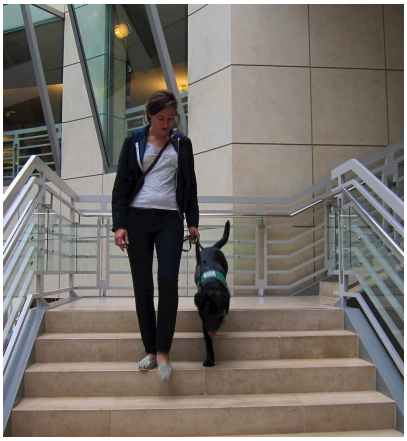
Increase muscle strength



Increase proprioception

Increase exercise challenge



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Goal: Return to Work!

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Post Op CCL Progression

Post-Op Period	Goals of Therapy	Therapeutic & Rehabilitation Modalities
Immediate (during hospitalization)	• Decrease swelling and effusion • Increase comfort	• GameReady™ (treatment device providing cryotherapy with compression) • Intravenous antibiotics, non-steroidal anti-inflammatory (NSAID) and pain medications
Day 3-5 through Day 14	• Decrease swelling and effusion • Increase comfort • Maintain range of motion • Increase weight bearing	• Cryotherapy • Passive range of motion • Rehabilitation therapy: manual techniques, cold laser, and/or therapeutic ultrasound, client education • Weight-bearing exercises • Oral NSAID and pain medications
Week 3 through Week 6-8	• Increase range of motion • Improve weight bearing • Increase muscle mass	• Passive range of motion • Rehabilitation therapy • Weight-bearing exercises • Strengthening exercises • Leash walks of incrementally increasing length
Week 6-8 through Week 10-12	• Increase muscle mass • Improve limb function • Proper tracking and proprioception	• Rehabilitation therapy: underwater treadmill • Increase challenge of strengthening exercises • Leash walks of incrementally increased length • Hill work and walks on varying terrain • Underwater treadmill therapy
Week 10-12 through Week 14-16	• Symmetry in muscle mass • Normalized limb function • Proper tracking and proprioception • Begin retraining and conditioning*	• Rehabilitation therapy: underwater treadmill • Controlled off-leash activity • Jogging • Easy combinations and straight lines
Week 14-16 through Week 18-20	• Retraining and conditioning	• Incrementally introduce more difficult equipment, turns with Jumps, and speed
Week 22-24	• Introduction to full agility activities	• A-frame and tunnels

Chart from Dr. Faith Lotsikas, Faithful Paws Veterinary

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Post op CCL protocol

	Exercise	Frequency
Days 1-3:	Cold Pack (over stifle, not on incision)	15 min. 2-3x/day
Strict cage rest, only leash walks to urinate/defecate	PROM (passive range of motion) *gentle flexion/extension only*	10-15 reps 2-3x/day
	Cold Pack **after** PROM *if tolerated*	5-10 min.
Days 4-7:	Hot Pack (over stifle and major muscles) **before** PROM	10 min. 2-3x/day
	PROM (see handout)	10-15 reps 2-3x/day
	Cold Pack (over stifle) **after** PROM	15 min. 2-3x/day
Day 5:	Begin SLOW leash walks, using sling to prevent slipping	5 min. 2x/day

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Post op CCL protocol

Week 2: Increase the leash walks by a minute or two each day 2-3x/day. Leash walks should not exceed 15 minutes. Encourage dog to put weight on affected limb with each step. A body harness is **highly** recommended for this purpose, especially if your dog likes to pull on the leash.

Exercise	Frequency
Hot Pack **before** PROM and active exercise	10 min.
PROM (see handout)	*see handout*
Slow Leash Walks	2-3x/day
Cold Pack **after** PROM and active exercise	15 min.

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Post op CCL protocol

Week 3-4: Continue with leash walks. Increase frequency to 3-5x/day instead of increasing duration of walks. Do not exceed 15 minutes per session. Add sit-to-stand exercises. This encourages active flexion and extension of stifle joint. Be sure your dog is not kicking the affected limb out to avoid proper flexion. You can prevent this by placing operated leg/side of dog against a wall to do the sit-to-stand exercises.

Exercise	Frequency
Hot Pack **before** PROM and active exercise	10 min.
PROM (see handout)	*see handout*
Slow Leash Walks	3-5x/day
Sit-to-Stand Exercises	2-3x/day
Cold Pack **after** PROM and active exercise	15 min.

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Post op CCL protocol

Week 8: **Radiographs** should be taken within this time frame. Continue all activities until radiographs are taken. If the radiographs reveal proper bone healing activities can be increased as follows.

Exercise	Frequency
Hot and Cold Packs (continue as before)	
Slow Leash Walks (gradual increase in time)	2x/day
Incline walks (begin with small inclines, a few meters)	2x/day
Sit-to-Stand Exercises	2-3x/day
Stair Climbing (begin with a few wide steps)	1-2x/day

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Post op CCL protocol

Do not start this until approval after the final radiographs
Week 8-12: All activities can be **gradually** increased at this point, as long as your dog is responding well. Other activities can be added to your rehabilitation program, varying the activities will prevent your dog and you from getting bored and can be helpful in working different muscle groups. Avoid any jumping activities until the after the 3rd month.

Exercise	Frequency
Hot and Cold Packs can be continued as needed for discomfort	
Leash Walks (continue to increase duration and speed)	**Gradual** increase to faster pace or longer lead
Incline walks (increase gradient)	1-2x/day
Stair Climbing	1-2x/day
Walking in circles or figure eights to increase balance perception	2-3x/day
Walking in shallow water, snow, tall grass, or sand	

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Questions/comments?

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