

# Canine TightRope<sup>®</sup> Coxofemoral Luxation

An Owner's Guide



Arthrex<sup>®</sup>  
Vet Systems

## COXOFEMORAL HIP LUXATION

The coxofemoral joint or hip, is a ball (femoral head) & socket (acetabulum) joint.

A hip or coxofemoral luxation occurs when the femoral head is displaced from the acetabulum. Hip dislocation is most often due to a traumatic event, with vehicular trauma being the most common type, but joint degeneration or [hip dysplasia](#) increases the risk. Due to the lateral force that is sustained through the femur, the hind limb is abruptly thrust toward the center of the body. This causes disruption of the ligament of the femoral head & joint capsule, resulting in luxation of the hip. In the majority of cases, the femoral head is forced up & forward from the acetabulum, a condition termed craniodorsal luxation. Ventral luxation is when the femoral head is dislocated downward, under the pelvis. This type of luxation is less common & is usually the result of a slip or fall that caused the dog to go “splay-legged.”

### SIGNS & SYMPTOMS

Following the injury, the dog is often unable to bear weight on the affected leg. If the animal can use the injured leg, the gait is typically characterized by external rotation of the knee & inward rotation of the hock (or ankle). The affected limb often appears shorter & a prominent, hard swelling may be noted above the hip joint, caused by the femur riding high on the pelvis.

Traumatic hip luxation is painful, impacting weight bearing & leg function. Leg carriage is dramatically altered by hip luxation. The leg is often tucked, outwardly rotated, & shortened or inwardly rotated & deviated dependent on the direction the hip is dislocated. In the majority of cases (90%), the femoral head is displaced forward & above the acetabulum (the hip socket). Partial dislocation of the hip joint (subluxation) can occur & is typically associated with joint degeneration as with [hip dysplasia](#). Subluxation is commonly bilateral whereas bilateral hip luxation is rare.

### DIAGNOSTICS

A full general examination & orthopedic evaluation should be performed due to the possibility of concurrent trauma. **The force required to produce hip luxation can also damage the urinary system, lungs, heart or other body organs.** Additional diagnostics are needed to assess the patient for other injuries or organ conditions which may affect anesthesia. Additional blood work is indicated to fully assess organ function, identify the extent of damage, identify pre-existing medical problems & for anesthetic planning.

- Bloodwork (CBC/CHEMISTRY)
- Radiographs (x-rays) of the hips are performed to assess direction of dislocation & other associated damage to the joint such as fracturing of articular surfaces (Figures 1 & 2). Heavy sedation or general anesthesia may be needed.
- Additional radiographs (chest, spine, abdomen or other limbs to assess for concurrent trauma)



### TREATMENT OPTIONS

Hip luxation must be treated quickly to avoid further damage to the joints & surrounding tissues. There are 2 treatment categories: “closed reduction” & “open reduction.” For closed reduction, the patient is placed under general anesthesia & a series of traction maneuvers are employed to replace or “reduce” the ball of the femur back into the socket of the pelvis. Once in place, the limb is put into a non-weight-bearing bandage called an Ehmer sling for 10-14 days. With closed reduction, stability of the hip is re-established with healing of the joint capsule, scar tissue, & surrounding musculature. Closed reduction is successful in approximately 50% of first attempts. It is most effective if performed within the first 12 to 24 hours following the traumatic event. Closed reduction is an inappropriate treatment option if bone fragments (avulsion of the ligament, rather than tearing) are present within the joint. When closed reduction fails, if there are concurrent orthopedic injuries (pelvic fractures, intra-articular fractures) or if immediate weight bearing is necessary, surgical intervention is warranted. If hip joint conformation is normal, then open reduction with stabilization is recommended. If the hip is severely dysplastic, then a total hip replacement or a femoral head & neck excision (FHO) is most appropriate.

1) **Non-Surgical Reduction of the Hip (closed reduction):** In a closed reduction the hip is replaced under short anesthesia & often supported in this position with a sling. Slings cannot always be applied due to limb trauma or leg conformation that doesn't tolerate sling placement. If used, slings must be monitored closely for rub sores or changes in position. If reduction is maintained for several weeks to support tissues to heal, then surgery is avoided with good results. Closed reduction is successful ~50% of the time if done early.



“Ehmer Sling - craniodorsal luxation”  
\*\*prevent adduction\*\*



“Hobbles - caudoventral luxation”  
\*\*prevent abduction\*\*

2) **Surgical Reduction:** Treatment consists of surgically replacing the hip (open reduction) & restoring the supporting structures. Additional supporting implants are usually placed to help mechanically support the hip during the healing phase. There are a large variety of techniques that may be chosen based on your veterinary surgeon's experience, including toggle rod fixation, surgical anchors, reconstruction of the joint capsule & trochanteric transposition. Success is high with most of these techniques.

3) **Femoral Head Ostectomy (FHO):** Restoration of the hip is often NOT feasible due to injury or poor hip conformation. The femoral head & neck ostectomy removes the femoral head & neck producing a “false joint.” Function is very good with this technique although there is a mild loss in function. With proper patient selection, good functional results are expected with this option. Postoperative physical therapy is of great benefit in maintaining good function after FHO.  
**The risk of recurrent luxation or implant complication is eliminated with this technique.**

4) **Total Hip Replacement:** In this scenario the joint is replaced with synthetic materials. Several hip replacement alternatives are available, which consist of replacing the femoral head & the acetabulum (ball & socket) with synthetic implants. A referral to a speciality veterinary center/hospital is required for this advance surgical procedure ie UC Davis Small Animal Teaching Hospital per Small Animal Surgery Service.

## Coxofemoral Luxation Repair - TOGGLE PIN w/ TIGHTROPE

This surgical (open reduction) technique is a form of “toggle rod stabilization.” A strong biomaterial is used to stabilize the hip joint while the supportive structural tissues heal. The biomaterial is an ultra-high molecular weight polyethylene suture material that is used extensively in human surgery for many orthopedic applications. This material has properties that make it stronger & less prone to failure than any other suture material.

TightRope coxofemoral luxation stabilization is similar in concept to using a molly bolt to anchor a heavy object to a wall. The biomaterial suture is looped through a flat piece of surgical titanium called a toggle. The toggle is then passed through a hole drilled in the wall of the acetabulum & then “flipped” up against the wall of the acetabulum. The looped suture strand is then advanced through a tunnel created in the femoral neck & secured to the outer aspect of the femur by tying the suture strands over a “button.”

## POST-OP CARE

Limb use following surgical repair is often immediate; however, restricted activity is mandatory for 8 to 12 weeks following surgery to allow the joint capsule & surrounding musculature to heal. Professional rehabilitation therapy starting at 2 weeks post-op is strongly encouraged. The patient can return to normal activity once range of motion of the hip joint & muscle mass of the limb return to normal. Patient who starts physical rehab therapy early & on consistent schedule tend to recovery better & faster than their counter part without or limited exercise therapy.

Rates of re-luxation rate following repair are low with the TightRope system, occurring in <5% of cases. Possible implant infection, inflammatory reaction from the body against the implants may occur. Implants may be required to be removed if only your pets become clinically lame again, painful, infection or implant reaction. If you notice these problems, please consult with your primary veterinary &/or veterinary surgeon.

**Healing of the supporting structures of the hip requires several weeks &** your pet’s activity will need to be restricted for at least 6 - 8 weeks. Longer periods of restriction may be needed for certain procedures. Following healing of regional supporting hip structures, re-strengthening of the limb musculature will require an additional period of controlled progressive activity. These guidelines will need to be individually modified by your primary care veterinarian through your pet’s recovery.

Aftercare will also be customized for both rate of recovery & for the specific repair performed (recovery after femoral head ostectomy may be accelerated). Coexisting injury, patient physique, & other ailments will also influence recovery recommendations. Controlled activity with exercises is often started by 1-2 week(s) following surgery.

**Most complications are NOT life threatening, but can be nonetheless frustrating.** These include re-luxation of the hip; implant complications; & bandage & sling complications. Complications delay recovery & can limit ultimate functional outcome. Be mindful that even the best patients are NOT fully cooperative with exercise restrictions & uncomfortable slings. Failure can occur with a simple unlucky fall or slip during the recovery process. Post-treatment activity can cycle implants causing them to migrate & break. Slings used for immobilizing the limb can migrate producing severe injury to the leg & must be monitored carefully.

**Prognosis is GOOD to EXCELLENT for eventual return of good-excellent limb function depending on the severity of injury or underlying degeneration.** Additional treatment may be required for failed closed hip reduction requiring further surgical repair. Historically ~50% of closed hip reductions & 10-20% of open reduction require further surgical repair. The requirement of revision is NOT necessarily a failure of a surgical technique as patient condition, associated injuries, hip architecture, patient compliance & aftercare all play a role. Persistence & dedication eventually produce good functional outcome in the majority of patients.



## STEP BY STEP - TOGGLE PIN Surgical Procedure

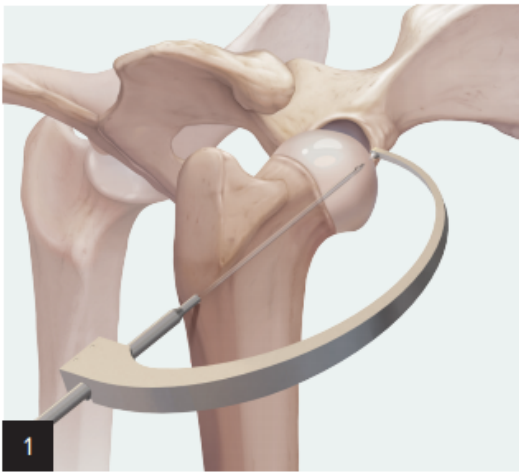
Surgical Procedure can be viewed on the following website if interested.

The surgical procedure video is graphic so proceed with caution.

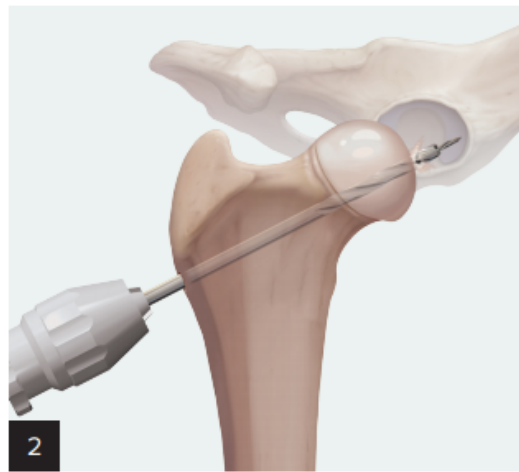
[https://www.arthrexvetsystems.com/resources/video/E2Pc\\_PK78UW4agFm5XRb2A/coxofemoral-luxation-repair-using-the-reduced-hip-implantation-technique-with-tightrope-implant](https://www.arthrexvetsystems.com/resources/video/E2Pc_PK78UW4agFm5XRb2A/coxofemoral-luxation-repair-using-the-reduced-hip-implantation-technique-with-tightrope-implant)

### Reverse Technique

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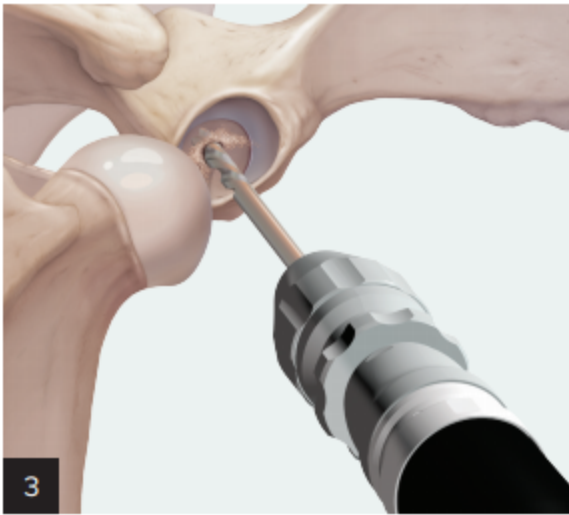


Using the femoral aiming guide, place a 0.049 inch K-wire from the third trochanter exiting the fovea capitis.

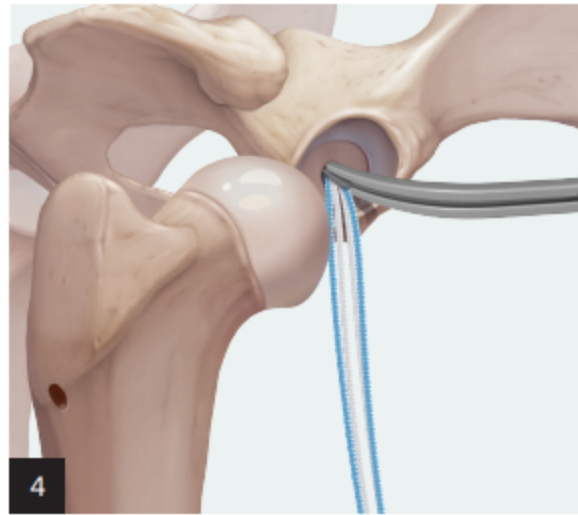


Insert the appropriate-sized cannulated drill bit over the guidewire and advance through the femoral bone. Gently ream back and forth or oscillate to ensure all bone is removed from the tunnel. Refer to the chart for the appropriate drill bit size.

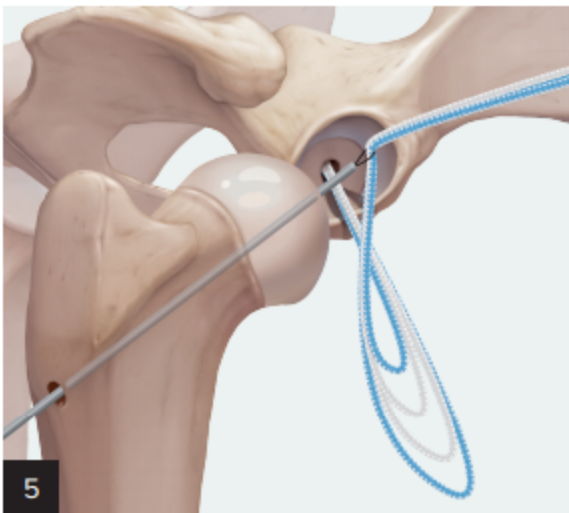
## Reverse Technique



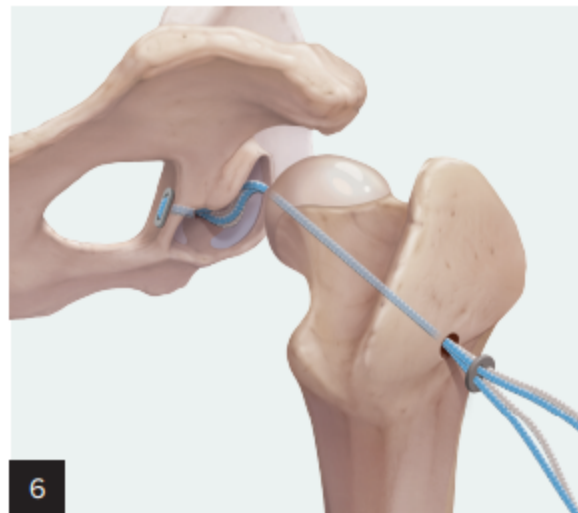
Use the cannulated drill bit to create a hole in the acetabulum at the acetabular fossa. Use caution when drilling to ensure you stop advancing the drill as soon as the medial acetabular wall has been penetrated.



For the TightRope® implant, grasp the toggle button with a curved hemostat and advance it into the acetabular hole. Push the toggle completely through the hole and pull on the suture strands. This will allow the toggle button to flip and seat firmly on the medial wall of the acetabulum.

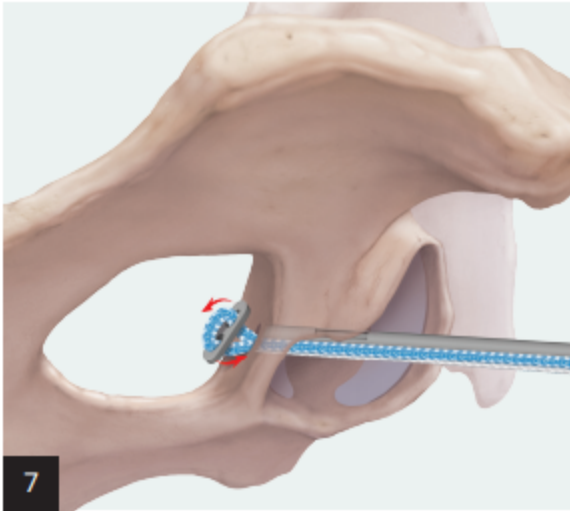


Insert the blunt end of the Nitinol loop through the femoral tunnel from the fovea capitis exiting laterally at the level of the third trochanter. On the Tightrope implant, untie the knot from the suture material. Remove the 4-hole button. Then place the free ends of the suture material through the Nitinol loop.

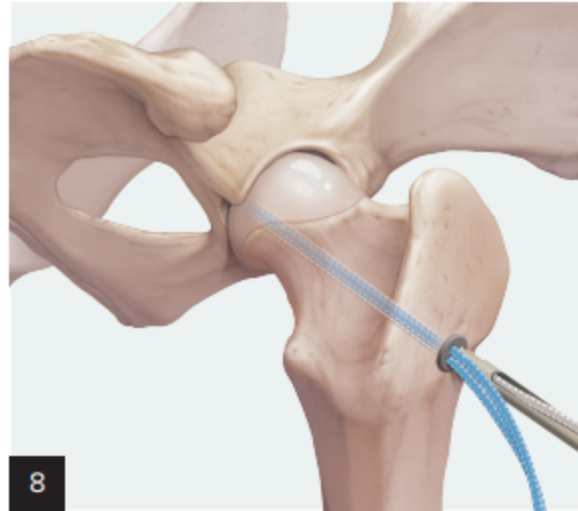


Pull the suture through the femoral tunnel. Remove the suture from the Nitinol loop. Insert the free ends through the 4-hole button and tie the suture material.

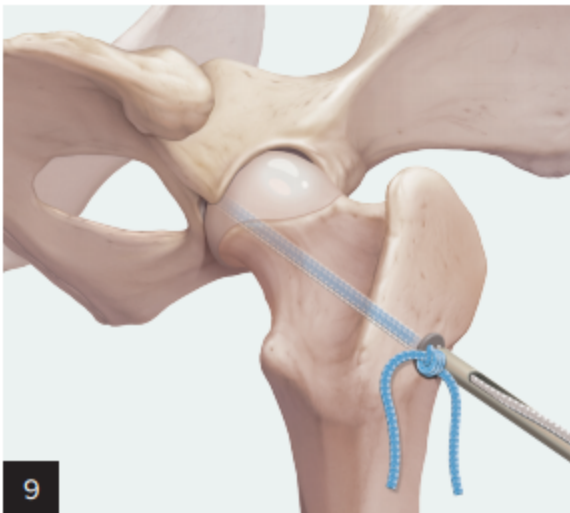




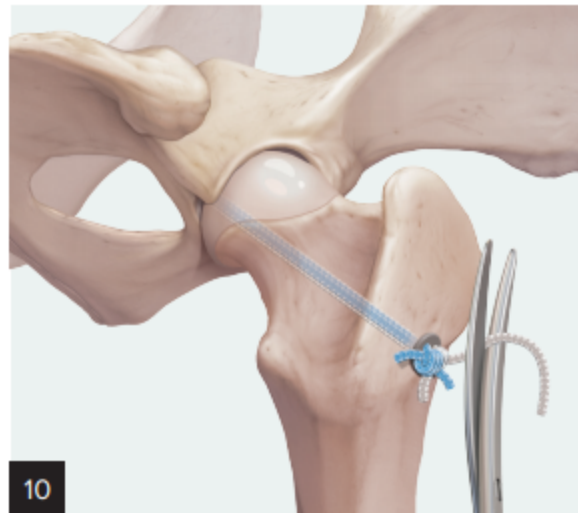
Remove slack from the suture material as the femoral head is reduced into the acetabulum to ensure the femoral head is properly oriented.



Apply the tensioner to the TightRope® implant system by pulling 2 strands of same-colored suture into the tensioning device and setting at a low tension (5 lb-7 lb). Put the hip through a gentle range of motion (ROM) to ensure the repair is not overtightened.



Tie the 2 strands of suture material not in the tensioner over the oval button. Four to 5 throws are recommended to secure the knot. Remove the tensioner from the suture material. Manipulate the hip to ensure a smooth ROM without impingement.



If satisfied with the ROM, tie the remaining strands of suture material and cut the suture limbs, leaving 2 mm-3 mm of suture. Close the joint capsule in a routine manner followed by a routine closure of the deep gluteal tendon, lateral fascia, and more superficial tissues. External coaptation is not necessary following this procedure.



Before Surgery



After Surgery



# Post-Surgery Care

## (Physical Rehabilitation Recovery Exercise)

In home patient care after orthopedic surgery is critical to the success of your pet's recovery. Allowing your pet too much activity may alter the anticipated outcome of the surgery. Your pet should start weight bearing within the 1st week then starts to walk on a leash during the 2nd week.

The following instructions will be your guide to home care:

(Note: if your pet is walking normally, no matter how soon after surgery, you may stop all rehabilitation exercises, but continue leash controlled activity for a minimum of 8 -10 weeks to allow full healing of soft tissues).

### **WEEK 1**

1. Provide pain management with NSAID's & pain medication +/-sedative the first 5 days or so.
2. Do NOT remove the Elizabethan collar until sutures removed in 14 days to prevent infection to the surgical site & implant.
3. After day 1; please start physical rehab exercise as indicated on the chart below.

### **WEEKS 2 & 3**

1. Stop passive range of motion exercise if your pet is using the leg correctly
2. Schedule a recheck with your doctor 14 days after surgery to remove any sutures & evaluate range of motion & percentage of weight bearing.
3. Most patients begin to "toe touch" when standing by week 1, but every pet is different & some may take longer.
4. If you notice your pet's pain level getting worse after the last pain medication &/or sedation Rxs, please call & ask for a refill.

### **WEEKS 4 & 5**

1. If available, swimming exercises for 1-3 minutes twice daily is helpful.
2. Most pets will be putting full weight on the leg at this point in time on a slow walk.

### **WEEKS 6 – 8**

1. Schedule another recheck with your veterinarian at 6-8 weeks after surgery to evaluate your pet's progress.
2. Most pets will be using the leg without a limp at this point in time

### **WEEKS 8 - 10**

At this point, your pet's limping should be resolved & activity should gradually return to full activity by the end of 10 weeks.

CHART: REHABILITATION PROTOCOL FOR POST-HIP LUXATION SURGICAL REPAIR

Treatments/ Modalities	Day 1-7 Toe Touching	Day 7- 21 Early Weight Bearing	3-4 WK	5-8 WK	8+ WK
Pain medications	As directed	As directed	PRN	PRN	PRN
Cryotherapy	15-20 min 3 times daily before walks or exercises First session immediately after surgery	Use after exercise for 15-20 min up to 3 times daily	PRN	PRN	PRN
Heat therapy		Apply heat to the thigh and hip muscles before exercise	PRN	PRN	PRN
Massage	Gentle massage around the surgical site, lumbosacral area and thigh	Continue twice daily	Once to twice daily	PRN	PRN

PROM	10 repetitions 3-4 times daily, focus on extension of hip	PROM and hip stretches (10-20 reps) 3 times daily Evoke flexor reflex and bicycle affected leg (2-5 min)	Continue 15-20 reps flexion and extension of all joints of affected leg once to twice daily	PRN	PRN
Laser therapy	Daily	Every other day for 1 week then twice weekly	Twice weekly	PRN	PRN
Walks	5-min supported leash walk 2-3 times daily	Increase each walk by 2-3 min each week	Increase by 5 min each week	Increase by 5 min each week	15- to 20-min walks 2-3 times daily
NMES	10 min twice daily	10 min twice daily	Discontinue if dog is doing well		
Balancing		5 min twice daily on soft pad	5 min 2-3 times daily, can use egg ball or disc	One-leg standing up to 5 min 2 times daily or balancing on inflatable ball	10 min balancing on inflatable ball

Cavalettis/obstacles/sit to stand			5 min twice daily for cavalettis Sit to stand do 10-15 reps BID	5 min twice daily for cavalettis Sit to stand do 15-20 reps BID	5 min twice daily for cavalettis Sit to stand do 15-20 reps BID
Jogging/Stairs			1 flight stairs once daily, 3 min light jogging	2-4 flights of stairs 1-2 times daily, 3-5 min light jogging on flat surface	2-5 flights of stairs 1-2 times daily, 3-5 min light jogging on flat surface
Hills				Zigzag low slow hills 5 min up and down	Increase to 10 min twice daily
Underwater treadmill		Start after day 14: 5-10 min total daily	10 min daily or every other day	15-30 min twice weekly	15-30 min twice weekly until released from rehab
Swimming			2-3 days per week	2-5 days per week	As desired as part of home exercise program

*BID*, Twice daily; *NMES*, neuromuscular electrical stimulation; *PRN*, as needed; *PROM*, passive range of motion.



#### ADDITIONAL INSTRUCTIONS:

1. Licking at the incision should be discouraged because it may lead to chewing at the sutures causing a wound infection &/or pre-dispose the implant to infection. It may be necessary to bandage the leg or use an Elizabethan collar or collar donut or long t-shirt to cover the upper thigh hip region to prevent trauma.
2. Feed your pet its regular diet but reduce it by 10-20% to account for reduced activity which means less calorie usage. We do NOT want your pet to gain weight. Your pet should have a lean body condition score. Lean pets usually recovery better than pets that are overweight.
3. Mild swelling may occur near incision or low on limbs. Your veterinarian should check moderate or severe swelling immediately.

#### COMPLICATIONS:

As with any surgical procedure, complications can occur. Unlike human patients who can use a sling or crutches, our patients do NOT know enough to NOT exert too much force & activity on the surgical leg/hip, so restricted activity is a major responsibility of you, the pet owner. Failure to follow these instructions carefully can lead to delayed healing.

The most common complication is delayed healing, where, despite our best efforts individual patients respond slower than others. In larger pets or pets with pre-existing arthritis, it can take up to 6-8 months for a full recovery. As long as you are noticing some improvement on a month to month basis, healing is still progressing.

If your pet does NOT continue to improve after 2-4 weeks & the leg use is NOT satisfactory, physical therapy with a trained veterinary physical therapist can be very rewarding & is highly recommended. Slow healing patients can usually be treated successfully if brought to the surgeon's attention immediately. Waiting several months can lead to loss of range of motion & muscle atrophy making resolution more difficult. Scar tissue & muscle fibrosis is more easily prevented than treated.

In ~5-10% of patients, the iliopsoas muscle (groin muscle) can become strained from constantly holding the leg up immediately after surgery for several weeks. Strict confinement & rest along with muscle relaxants & pain medicine usually resolves this discomfort in 1-2 weeks.

Surgery is sometimes necessary to alleviate a severely strained or torn muscle. Rarely, infections can develop & will need to be treated with different or stronger antibiotics than those used right after surgery.

95% of infections in veterinary medicine are due to owners allowing their pet to lick the incision by taking off the e-collar placed on your pet after surgery. Notify your veterinarian if you notice any discharge from the incision.

If you would like assistance with your pet's exercise recovery, please let your veterinary team know so we can provide a referral to a local veterinary physical rehabilitation center. If you have any questions, please feel free to ask your primary veterinarian &/or veterinary surgeon.

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