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Cranial Cruciate Ligament Rupture in the Dog

P Profile

Definition

Cranial cruciate ligament rupture (CCLR) is the most common cause of hindlimb lameness in dogs and is underdiagnosed in veterinary patients. Osteoarthritis (OA) of the joint occurs secondary to ligament rupture and advances rapidly if the stifle is not stabilized.

Systems. The cranial cruciate ligament limits cranial tibia thrust (cranial movement of the tibia in relation to the femur during weight-bearing), internal rotation of the tibia, and hyperextension of the stifle.

Genetic Implications. CCLR may be a recessive heritable disease.

Incidence/Prevalence. All dogs are at risk for CCLR. Large-breed dogs have an increased incidence.

Signalment

Species. Dogs are the most commonly affected small animal species.

Breed Predislection. Labrador retrievers, rottweilers, bullmastiffs, and chow chows are at increased risk.

Age and Range. CCLR occurs in skeletally mature dogs; incidence increases in middle-aged and older dogs, peaking between 5 and 7 years of age. Skeletally immature dogs

rarely have CCLR and only with external trauma.

Gender. More prevalent in females. Neutered dogs of both sexes are at slightly higher risk than intact dogs.

Causes

Initiating cause is unknown but was recently hypothesized to be a subclinical bacterial influence that causes slow degeneration of the cruciate ligament. CCLR occurs less commonly as a classic acute rupture after trauma.

Risk Factors

Active sporting or working dogs are most often affected. Obese dogs and dogs with underlying systemic disease are more prone to rupture. Many dogs with unilateral CCLR subsequently rupture the opposite cranial cruciate ligament over their lifetime.

Pathophysiology

CCLR is caused by hyperextension injury during activity. Instability of the stifle causes rapid changes in mechanical properties of subchondral bone and OA characterized by thinned articular cartilage and periarticular osteophyte production, with increased joint effusion. Structural damage to the medial meniscus occurs with chronic CCLR.

Signs

History. Dogs with CCLR often have a history of acute lameness for several days that improves but then recurs 4 to 6 weeks later

and worsens. In as many as 30% of dogs, bilateral rupture is present at the time of initial diagnosis.

Physical Examination. The stifle will be swollen and painful upon palpation and during range of motion tests. Joint crepitation may be palpated; palpation of a medial thickening or "bump" (Figure 1) over the proximal and medial aspect of the tibia is common and may be pathognomonic for CCLR. Laxity of the stifle can be detected by cranial drawer or cranial tibial thrust procedures.

continues



Medial buttress is a firm swelling palpable on the medial aspect of the proximal tibia (arrow).

CCLR = cranial cruciate ligament rupture; OA = osteoarthritis

Pain Index

Dogs exhibit moderate discomfort during normal activity by decreased weight-bearing on the affected limb and by sitting with the affected limb held to the side. Dogs exhibit moderate to severe signs of pain on palpation.

Dx Diagnosis

Diagnosis is made by elicitation of positive cranial drawer or cranial tibial thrust or by palpation of medial buttress.¹ Medial “buttress” occurs rapidly after ligament rupture, and is ample indication for surgical joint exploration even in the absence of laxity.

Radiographic signs of stifle OA are supportive of CCLR diagnosis (Figure 2).



Radiographic signs of stifle osteoarthritis secondary to cruciate ligament rupture include periarticular osteophytes on the patella (arrows), trochlear ridges and tibial crest (arrowheads), and a compressed fat pad sign (red arrow).

Definitive Diagnosis

Diagnosis of CCLR is based entirely on history of lameness and stifle laxity found on cranial drawer or cranial tibial thrust.

Differential Diagnosis

Any causes of radiographic signs of stifle OA in dogs are differential diagnoses of cruciate ligament rupture. Many dogs with hindlimb lameness due to CCLR have concurrent hip dysplasia. One third of dogs referred for total hip replacement with a diagnosis of hip dysplasia have acute changes in severity of lameness because of recent CCLR.

Laboratory Findings/Imaging

Joint fluid analysis indicates degenerative disease of the stifle, with mild to moderate increases in total cell count (2000 to 5000 cells/ μ L) and decreases in fluid viscosity. Cytologic evaluation shows mononuclear cells with nondegenerative polymorphic neutrophils and no extracellular or intracellular bacteria.

Tx Treatment

Treatment for CCLR is surgical, for both large- and small-breed dogs.

Medical

Medical therapy should be considered ancillary to surgery. Medical therapy without surgery results in progression of OA and lameness in affected dogs.

- **Nonsteroidal antiinflammatory drugs** may be used to alleviate patient discomfort. The NSAID drug of choice should be given postoperatively at label doses as needed for analgesia and continued for pain relief from OA.
- **Narcotic analgesics** should be administered only in animals with refractory pain.

- Other **joint supplements or treatments**, such as polysulfated glycosaminoglycans, glucosamine, chondroitin sulfate, milk proteins, pentosan polysulfate, or magnesium, are less consistently beneficial and their use should be based on practitioner evaluation of the evidence.
- **Corticosteroids** are contraindicated in canine OA.

Surgical

In studies, 81% to 100% of large-breed dogs remain lame unless surgical correction is performed. Numerous surgical techniques, including intraarticular fascial grafts and fibular head transposition, have been reported, but do not result in return to normal weight-bearing and are no longer recommended. Three current surgeries can be recommended on the basis of roughly equivalent ground-reaction outcome measures:¹

- Extracapsular lateral fabellar suture stabilization technique (LSS)
- Tibial tuberosity advancement (TTA)
- Tibial plateau leveling osteotomy (TPLO).

TPLO and TTA are the 2 procedures currently considered the best surgical therapy for large dogs. Little reason exists to prefer one over the other at this time. Two recent reports indicate a slightly higher “major” complication rate for TTA (approximately 11% compared with 8% for TPLO).^{2,3}

In comparing techniques, TPLO was subjectively better than LSS technique in a 6-month study, but force plate analysis showed no differences at 2 and 6 months among the 3 techniques. At least 1 report suggests that radiographic OA advances faster in dogs that have had LSS rather than TPLO.

Activity

Physical therapy regimens are reported to improve mobility and relieve pain in animals with CCLR, but randomized clinical studies of efficacy have not been reported.

After any surgical procedure, activity should be restricted to cage rest for at least 8 weeks. Dogs that have had TPLO or TTA should be restricted until radiographs indicate complete bone healing. Limited leash-walking or controlled underwater treadmill physical therapy may hasten functional recovery.

Nutrition

Weight loss to lean body condition score (BCS 2) is recommended to decrease stress on the affected leg and protect the unaffected limb from rupture. Animals with secondary OA of the stifle should be placed on high omega-3 fatty acid diets or dietary supplementation to improve clinical signs and decrease innate inflammatory processes.

Alternative Therapy

There are no controlled clinical trials establishing efficacy of alternative therapies for treatment of CCLR.

Client Education

Inform clients that dogs with unilateral CCLR may eventually rupture the contralateral ligament. The usual postoperative instructions should also be given, including observation and care of surgical incisions, exercise restrictions, and potential postoperative complications. Clients of dogs undergoing TPLO or TTA should be told of the expected occurrence of pitting edema around the hock, peaking at 4 to 5 days after surgery.



Follow-Up

Patient Monitoring

Patients undergoing TPLO or TTA should have postoperative radiographs to assess bone healing at 8 weeks and then at 4-week intervals until the bone is healed.

Prevention

There is no known way to prevent CCLR beyond maintenance of lean body weight in large-breed sporting or working dogs.

Complications

Major complications of TPLO and TTA include iatrogenic fracture of the tibial tuberosity, failure of the surgical implants, failure of the osteotomy to heal, and osteomyelitis or contamination of the implants. Fibular fractures have also been noted as a complication of TPLO. Infection and loosening or breakage of the sutures have been noted as major complications of LSS. Minor complications of all procedures include postoperative bruising, edema, swelling, or problems with incision healing.

Course

Most dogs begin to bear weight by the third day after surgery. At 8 weeks after surgery, most animals should be bearing weight and ready to begin increased activity, although clinical improvement often continues for 6 months after surgery.

Future Follow-Up

Dogs should be periodically monitored for advancement of OA, with treatment adjusted accordingly.



In General

Relative Cost

- LSS \$\$\$\$\$
- TPLO \$\$\$\$\$
- TTA \$\$\$\$\$
- Adjunctive physical therapy \$\$\$

Cost Key

\$ = < \$100	\$\$\$\$ = \$500–\$1000
\$\$ = \$100–\$250	\$\$\$\$\$ = > \$1000
\$\$\$ = \$250–\$500	

Prognosis

Excellent. Prognosis for return to function in dogs after surgery is > 90%.

Future Considerations

Several variations of the cranial tibial wedge osteotomy have been reported in the international literature, but there are still too few reports to support their use over TPLO or TTA. Total stifle replacement implants have been commercially introduced, but long-term function and complication rates have not been reported. ■

See Aids & Resources, back page, for references, contacts, and appendices.

Article archived on www.cliniciansbrief.com

CCLR = cranial cruciate ligament rupture; LSS = extracapsular lateral fabellar suture stabilization technique; NSAID = nonsteroidal antiinflammatory drug; OA = osteoarthritis; TPLO = tibial plateau leveling osteotomy; TTA = tibial tuberosity advancement