

Returning to Agility Competition After TPLO Surgery

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By Shannon Heidorn, DVM, Sherman O. Canapp Jr., DVM, MS, CCRT, DACVS, DACVSMR, M. Christine Zink, DVM, PhD, ACVP, DACVSMR, Christopher S. Leasure, DVM. Photos courtesy of VOSM except where noted, illustrations by Cindy Telley.

Winnie is a 10-year-old female spayed Pembroke Welsh Corgi that first presented to the Veterinary Orthopedic and Sports Medicine Group (VOSM) for left pelvic limb lameness in October of 2011. Winnie's owners first noticed a problem at competitions. Winnie was adding strides before jumps, but her times were still very fast. She was evaluated at VOSM where no indication of stifle instability was found, but groin muscle pain was discovered. She was treated for a possible groin muscle strain with rehabilitation and laser therapy. She continued to compete in the USDAA Championship classes but her owners felt it was taking more effort for her to jump at 12". She concurrently competed in AKC agility at 8" and was doing well. In the beginning of November Winnie was slowing down and continued to have a hard time with the 12" jumps in USDAA. Her owners began considering whether they wanted to drop her down to the 8" Performance classes. She was taken to VOSM for a recheck prior to making this decision.



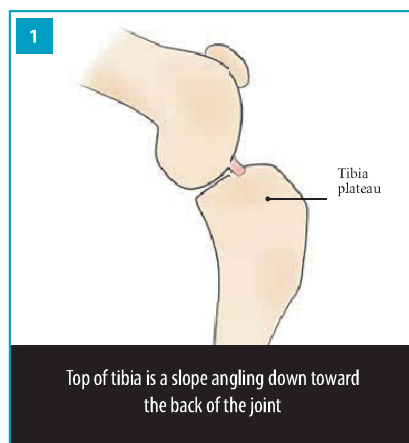
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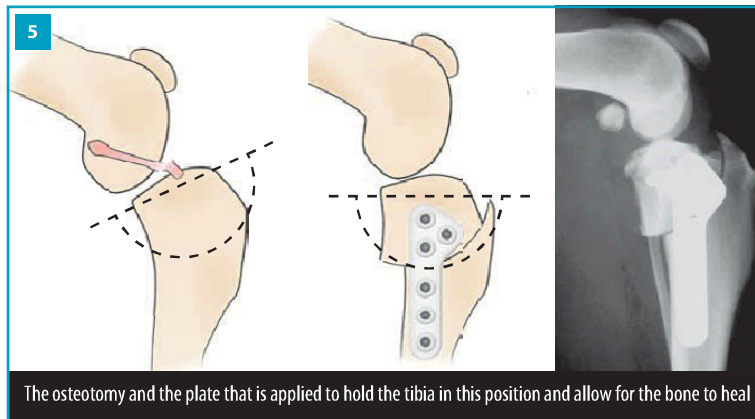
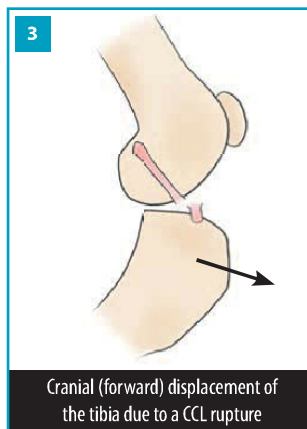
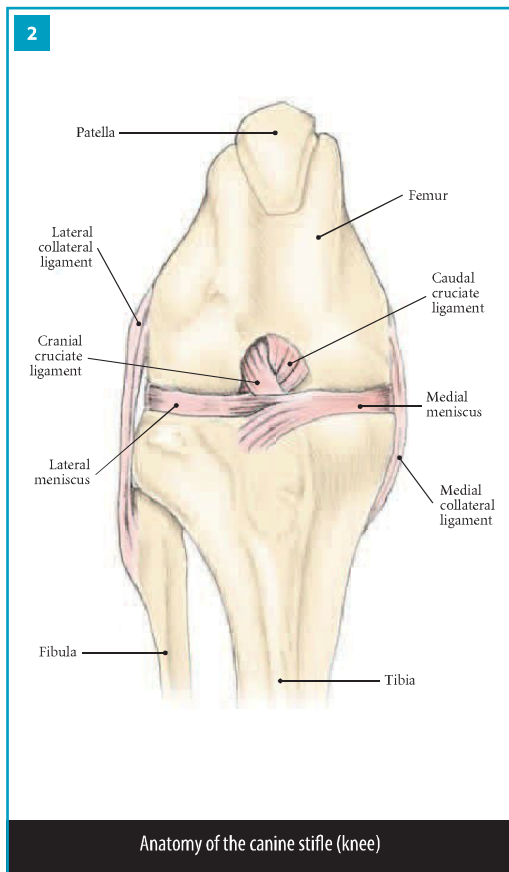
During the evaluation it was noted that Winnie had a shortened stride in her left hind limb at a walk and a trot. Winnie was also noted to off-load her left hind limb in the stance phase, shifting her weight more toward her right hind limb. On physical examination, Winnie had mild muscle atrophy of the left hind limb when compared to the right. Pain was found on extension of the stifle and a mild amount of effusion (fluid due to an inflammatory stimulus) was palpated within the joint space. Instability (cranial drawer and tibial trust) was noted on manipulation of the tibia in relation to the femur when the stifle was placed in flexion (indicating a partial cranial cruciate ligament tear). Based on the clinical signs and the physical exam findings surgical intervention using a Tibial Plateau Leveling Osteotomy (TPLO) to stabilize the knee was recommended.

The TPLO was performed in November of 2011 and Winnie was placed in a post-operative rehabilitation therapy program. She made an excellent recovery and returned to agility 4 months after her surgery. In March of 2012 she competed at the AKC Nationals. In May she earned a MACH 3 and in February she achieved MACH 4. In June of 2013 she earned her MACH 5 and qualified as the top Corgi at 8" for the AKC Invitational. In October of 2013 she attended the USDAA Nationals and won the warm-up class at 8". She got 1st place in the Grand Prix Semifinals and ran the fastest time in the final. At the AKC Agility Invitational in December 2013, Winnie finished 3rd in the final at 8". Within 2 years of Winnie's TPLO surgery she earned her USDAA ADCH Bronze at 12" and her average yards per second was higher than prior to cruciate ligament injury.

Cranial Cruciate Ligament Injuries

Cranial cruciate ligament (CCL) insufficiency is the most common injury occurring in the canine stifle (knee) joint. A rupture of this ligament causes pain, lameness, and arthritis formation. Instability may lead to injury of other structures in the knee (the meniscus). In dogs the shape of the top of the tibia (tibial plateau) is a slope with the angle facing down toward the back of the joint. See **Figure 1**. During normal weight-bearing the femur presses down on the top of this slope and creates a force that tends





to push the tibia cranial (forward) in relation to the femur. This force is called “tibial thrust.” The cranial cruciate ligament is the structure responsible for resisting tibial thrust and preventing the tibia from moving forward during weight bearing. When the cranial cruciate ligament is torn, the tibia is able to move in relation to the femur (stifle instability) leading to pain and inflammation.

The menisci are the C-shaped cartilages that are attached to the top of the tibia and act as shock absorbers in the knee. See **Figure 2**. If tibial thrust is present, the menisci—which normally withstand compressive forces—are subjected to shearing forces (forward and backward rather than crushing movement). See **Figure 3**. This shearing leads to ripping and tearing of the meniscus. If the meniscus is torn it will flip back and forth (much like the handle on a bucket) and lead to rubbing against articular (joint) cartilage causing inflammation and pain. See **Figure 4**. Damage to the meniscus also leads to further osteoarthritis formation, long-term pain and decreased range of motion.

Treatment

There are numerous techniques for the treatment of cranial cruciate ligament injury. The most commonly used procedures include the tibial plateau leveling osteotomy (TPLO), tibial tuberosity advancement (TTA), and lateral suture techniques. A gold standard for surgical correction and stabilization has not yet been universally established in veterinary medicine. A number of studies in veterinary literature suggest that patients receiving a TPLO procedure have a faster recovery, better function, and slower progression of osteoarthritis compared to other forms of stabilization.^{1,2,3,4,5} This is why the TPLO procedure has been considered the treatment of choice for cranial cruciate ligament insufficiency by the surgeons at VOSM. See **Figure 5**. The studies currently published measuring functional outcome after a TPLO are based on objective gait analysis and radiographic examination. No current studies have examined return to competitive sport after surgical procedures in small animal medicine.

Return to Competitive Sport

Successful surgical outcome in human and equine (horse) sports medicine is often measured by return to competitive sport and postoperative athletic performance. The closest comparisons to human and equine athletes in dogs are those participants in dog agility. Agility involves speed, sharp turns, and jumps. This can cause canine athletes to suffer injuries to the shoulder (medial shoulder syndrome, biceps and supraspinatus tendinopathies) and to the hips and knees (iliopsoas strains and CCL insufficiency).^{6,7} Injury to the canine cranial cruciate ligament is reported to have one of the longest recovery and retraining times, making it among the most severe injuries in canine athletes.⁶ VOSM conducted a retrospective study examining return to agility in dogs that had a TPLO for the correction of cranial cruciate ligament rupture. We wanted to determine if these dogs were able to return to competitive sport, and if they were able to do so at the same performance level as they had prior to CCL injury.

A large proportion of dogs in our study were able to return to agility after having a TPLO performed for correction of CCL insufficiency. We found that, based on the VOSM Return to Agility Grading Scale, a large proportion of the dogs that returned to agility (like Winnie) were performing at or above their pre-injury level.

Based on the parameters used in human and equine medicine and the structure of AKC agility competition, we derived a list of factors to gauge performance in AKC agility dogs. These parameters include return to agility, average yards per second (AYPS), jump height, and average number of dropped bars per run. These parameters were compared pre- and post-operatively to determine performance level. The ability to return to activities of daily living (ADL) was also considered as a base level of activity in both the return and non-return groups. ADLs were defined as the ability to go outside to eliminate, to walk up and down stairs, to get on and off of furniture, and to eat and drink normally.⁸

Of the greater than 2,000 TPLO procedures performed at VOSM over a 7-year period, we evaluated those that were

performed on agility dogs. A survey was compiled and sent to all owners of active agility dogs via e-mail to collect information on pre- and post-operative AYPS, jump height, average dropped bars, and ability to perform ALDs. All of the respondents felt that their dogs were able to return to normal activities of daily living after having the TPLO procedure. A significant proportion of dogs were able to return to agility within 9 months of having a TPLO for correction of either a partial or complete tear of their CCL. Of the dogs that did not return to agility, more than half of the owners responded that they did not return their dogs due to reasons unrelated to TPLO surgery. These factors included lack of time or finances for retraining, other concurrent injuries leading to the inability to perform, fear of damage to the opposite CCL, or fear of trauma to other limbs.

A return to pre-injury level of sport is thought to represent the most vigorous assessment of successful return to sport outcome in human medicine.⁹ In order to better classify dogs based on their return to agility and performance level we have developed the VOSM Return to Agility Grading Scale. This scale evaluates a dog and post-surgical procedure by categorizing them into a 1 to 5 grading system based on their performance level. Dogs are grade 1 if they did not return to agility for reasons unrelated to the surgery (such as owner time or finances). Dogs are grade 2 if owners return them to agility training, but they do not perform well enough to return to competition. Dogs are grade 3 if they return to agility competition but do not perform as well as they had prior to surgery. Dogs are grade 4 if they return



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Table 1 - VOSM Return to Agility Grading Scale

Grade	Post-Surgical Procedure
Grade 1	Owner chose not to return dog to agility for reasons unrelated to surgery.
Grade 2	Dog was physically unable to return to agility.
Grade 3	Dog returned to agility but performed worse than pre-operative level
Grade 4	Dog returned to agility and performed at pre-operative level
Grade 5	Dog returned to agility and performed better than pre-operative level

to agility competition and perform at the same level as they had prior to surgery. Dogs are grade 5 if they return to agility competition and perform at a level better than they had prior to surgery. See **Table 1**. We applied this grading scale to the respondents in this study and found that half of the dogs that returned to agility were performing at the same level or better than they had prior to CCL injury.

A large proportion of dogs in our study were able to return to agility after having a TPLO performed for correction of CCL insufficiency. We found that, based on the VOSM Return to Agility Grading Scale, a large proportion of the dogs that returned to agility (like Winnie) were performing at or above their pre-injury level. The dogs included in this study all had the TPLO procedure carried out by a VOSM surgeon. At VOSM the TPLO procedure is performed by residency-trained surgeons and is done, on average, between 15-30 times per week. The success of return to agility in this study is likely due to the specialty training and vast experience of the orthopedic surgeons performing the TPLO procedure at VOSM. The effort carried out by owners following the at home rehabilitation and return to sport training programs provided by VOSM are also contributing factors in successful return to agility. 🐾

Resources

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A special thanks to Darlene and Greg Paul for allowing VOSM to share Winnie's story.

Dr. Shannon Heidorn earned her Doctor of Veterinary Medicine from Western University after completing her undergraduate studies at the University of California, Davis. She then completed a rotating internship, and recently completed a surgical internship at Veterinary Orthopedic & Sports Medicine Group in Annapolis Junction, Maryland. Dr. Heidorn has special interests in orthopedic surgery and sports medicine for canine patients. Following her surgical internship at VOSM, Dr. Heidorn is now completing a surgical residency at Animal Specialty & Emergency Center in Los Angeles.

Sherman O. Canapp, Jr., DVM, MS, CCRT, DACVS-SA, DACVSMR, originally from Maryland, completed a combined Doctor of Veterinary Medicine/Master of Science at Kansas State University, an internship in small animal medicine and surgery at the University of Missouri, and followed up with a three-year residency in small animal surgery at the University of Florida. Dr. Canapp currently practices orthopedic surgery and sports medicine at Veterinary Orthopedic & Sports Medicine Group in Annapolis Junction, Maryland, where he is chief of staff. Dr. Canapp has earned diplomate status from both the American College of Veterinary Surgeons and the American College of Veterinary Sports Medicine and Rehabilitation. His primary focus and research is in arthroscopy, regenerative medicine, and sports medicine. Dr. Canapp lectures nationally and internationally and is a consultant for numerous organizations and medical companies.