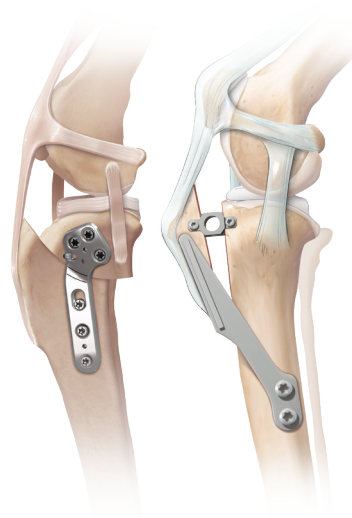


# Tibial Plateau Leveling Osteotomy (TPLO) Compared to Tibial Tuberosity Advancement (TTA) for Cranial Cruciate Ligament (CCL) Injury



Cranial cruciate ligament (CCL) injuries are one of the most common orthopedic injuries in canines. Canines are particularly susceptible to CCL injuries due to their stifle anatomy, which places increased strain on the CCL and leads to a high prevalence of tears. Due to the canine's joint size, reconstructing the ligament as in a human patient is uncommon, but rather a surgical procedure to alter the anatomy and forces on the stifle joint is completed. This procedure decreases the posterior draw on the stifle joint, which can decrease the laxity and progression to osteoarthritis in the stifle joint following the injury.

In a TPLO procedure, a curved cut is made in the tibia and rotated to make a more level tibial plateau, which is followed by a plate and screws to hold the TPLO plate in place. In a TTA procedure, a cut is made on the front (cranial) of the stifle where the patellar tendon connects to the tibia (tuberosity) and an implant is placed to cause the patellar tendon to pull the femur further forward, reducing the posterior draw placed on the stifle and reducing laxity following CCL injury. The TPLO has been hypothesized to be more effective than the TTA at altering the joint biomechanics to a more natural state and slowing the progression of osteoarthritis.

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## Experimental Study

[Subsequent meniscal tears following tibial tuberosity advancement and tibial plateau leveling osteotomy in dogs with cranial cruciate ligament deficiency: a in vivo experimental study.](#) *Vet Surg.* 2021;50(5):966-974. doi:10.1111/vsu.13648

- The objective of this study was to measure the effects of the TTA and TPLO on subsequent meniscal tears at 4, 12, and 32 weeks with clinical evaluation then meniscal macroscopic and radiographic evaluation at 12 and 32 weeks.
- For the clinical evaluation, the lameness score was not significantly different at all timepoints, but there was a nonsignificant increased lameness with the TTA group at 4 weeks compared to TPLO.
- For radiographic osteoarthritis (OA), the TTA group was significantly more progressed at 12 weeks compared to the TPLO group, but there was a nonsignificant increase in scoring at 32 weeks for the TTA group. The difference in scoring between timepoints was greater for the TTA group, indicating a more rapid progression of OA over time.
- At 12 weeks, 6 of 10 TTA patients had meniscal tears while 0 of 10 TPLO patients had meniscal tears, and at 32 weeks, 5 of 5 TTA patients had meniscal tears while 1 of 5 TPLO patients had meniscal tears.
- When comparing the macroscopic score of the meniscus, there was no chronological increased degeneration with the TPLO while the TTA had increased degeneration for the lateral meniscus at 32 weeks and significantly increased degeneration of the medial meniscus at 16 and 32 weeks.

## Takeaway

The TPLO procedure led to decreased progression of OA, fewer meniscal tears, and decreased meniscal degeneration when compared to the TTA procedure.

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## Laxity

[Influence of tibial plateau leveling osteotomy and tibial tuberosity advancement on passive laxity of the cranial cruciate deficient stifle in dogs.](#) *Vet Surg.* 2019;48(3):401-407. doi:10.1111/vsu.13177

- The objective of this study was to compare the joint laxity at 3° of flexion following a TPLO and TTA in CCL-deficient canines and controls with no repair and an intact CCL in an ex vivo study.
- At 150° of flexion, there was not a significant difference of translation between the intact CCL and each repair type, and there was no difference between repair types.
- At 135°, and 120° of flexion, there was a significant difference between the TTA compared to the intact CCL, but no difference was found when comparing the TPLO to the intact CCL.

### Takeaway

The TPLO procedure appears to provide improved tibial translational stability—similar to the stability of an intact joint—in the cranial/caudal plane vs the TTA procedure.

## Clinical Outcomes

[Extended long-term radiographic and functional comparison of tibial plateau leveling osteotomy vs tibial tuberosity advancement for cranial cruciate ligament rupture in the dog.](#) *Vet Surg.* 2020;49(1):146-154. doi:10.1111/vsu.13277

- The objective of this study was to evaluate how stifles treated with TPLO or TTA performed ≥3 years following the procedure based on clinical examination.
- This study analyzed 133 stifles receiving TPLO and 33 receiving TTA while both groups had similar descriptive data with only a significant difference coming from the 0.7 difference in the body conditioning score.
- There was no difference in pre-op OA score, but the TTA group increased significantly more than the TPLO group.
- Based on the client questionnaires, the TPLO performed significantly better or similar to the TTA in all categories, including pain, stiffness, function, gait, and quality of life.

### Takeaway

The TPLO procedure appeared to have favorable clinical outcomes as reported by the clients, and the TPLO showed a reduced progression of OA compared to the TTA.

Moore EV,  
Weeren R,  
Paek M



[Comparison of long-term outcomes associated with three surgical techniques for treatment of cranial cruciate ligament disease in dogs.](#) *Vet Surg.* 2013;42(3):329-334. doi:10.1111/j.1532-950X.2013.12001.x

- The objective of this study was to evaluate the >1-year outcomes following the TightRope®, TPLO, and TTA procedures for CCL injuries.
- This study included 79 TightRope procedures, 65 TPLOs, and 18 TTAs.
- TTA procedures involved significantly higher rates of complications, meniscal tears, and pain at follow-up.
- Significantly more TightRope procedure and TPLO cases reached full function compared to the TTA.

#### Takeaway

The TightRope procedure and TPLO both appear to be safer and more effective procedures vs TTA to return dogs to full function following a CCL injury.

### Systematic Review

[Tibial plateau leveling osteotomy and tibial tuberosity advancement - a systematic review.](#) *Tibial Plateau Leveling Osteotomy und Tibial Tuberosity Advancement – eine systematische Literaturübersicht.* *Tierarztl Prax Ausg K Kleintiere Heimtiere.* 2018;46(4):223-235. doi:10.15654/TPK-170486

- This study reviewed the literature of peer-reviewed TPLO and TTA articles to report on outcomes and complications associated with each procedure. This review did not control for study design or time of follow-up.
- A total of 91 studies were included in this review, including more than 13,000 operations.
- For joint stability, the TPLO procedure had a positive rate of only 0.3% in the tibial compression test while the TTA had a 13.9% positive rate.
- The thigh circumference following the TPLO procedure was significantly increased at 6 and 12 months while the TTA only reached significance at 12 months.
- Both procedures had an increase in OA radiographic scoring following injury, but the TTA procedure showed a greater increase in OA scores in the short term and midterm.
- When comparing owner surveys, the TPLO procedure showed a higher return to full function and a nonsignificant decrease in long-term pain.
- Overall, there was approximately a 25% decrease (15.9% TPLO and 20.8% TTA) complication rate following the procedure.

#### Takeaway

When comparing the TPLO to TTA, it appears that most peer-reviewed studies agree that TPLO increases joint stability and full recovery to function and strength while decreasing complication rates and progression of osteoarthritis.