

# **Advanced Practitioner Cranial Cruciate Ligament Masterclass Mini Series**

**Session One: The Stifle - Cranial Cruciate  
Ligament Disease: A Recap**

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## Introduction

Welcome to this CDP Solutions Cruciate Masterclass webinar series and these accompanying notes. The format of the series will be:

1. 2<sup>nd</sup> September – CrCL rupture principles, anatomy reminder, the menisci, inspection or not, to release or not? A review of currently available surgical techniques with a focus on evidence based medicine.
2. 16<sup>th</sup> September - TTA surgery; planning, step-by-step, complications and current evidence.
3. 30<sup>th</sup> September – TPLO surgery; the procedure planning, step-by-step and current evidence.

These notes provide a brief summary of the material presented in each webinar. Much of the material presented in the webinars is not in the notes as it is of a practical demonstration nature that can't easily be summarized in note format – you need to watch the webinar ☺

## **1. The stifle – quick review & extra-capsular suture**

### **Diagnosis & anatomy**

Making an accurate diagnosis depends on the signalment of the dog, the history, a physical examination and specific diagnostic tests.

- Signalment – dogs of any age, often young to middle aged. Overweight and neutered dogs over-represented. Almost any breed; rarely sight-hounds
- History – acute onset, sub-acute, chronic or acute-on chronic pelvic limb lameness.
- Physical examination: stifle effusion, medial buttress, cranial drawer and positive thrust instabilities, may have “meniscal click”, pain on stifle (or apparently hip) extension. Correct use of the cranial drawer and tibial thrust tests is important to avoid mis-diagnosis.
- Synoviocentesis – used to rule out septic arthritis particularly if history of previous surgery on the index joint. Otherwise rarely useful or performed.
- Radiography – very useful to essential to confirm the diagnosis (secondary changes), rule out other potential confounding differential diagnoses such as osteochondrosis or neoplasia. Also very important to plan surgery, whether extra-capsular, TTA or TPLO
- Arthrotomy / Arthroscopy – useful / essential to confirm the diagnosis of cruciate rupture, particularly if partial tear present. Also used to check meniscal health / status. Torn parts of cruciate ligament can be debrided, and any meniscal injury addressed at the same time.
- CT – more sensitive than radiographs to joint effusion and degenerative joint disease, but rarely used as rarely necessary. Cannot see individual soft tissues such as cruciate ligament unless use contrast CT, and is rarely worth the effort
- MRI – very sensitive (machine dependent) to soft tissue pathology such as cranial cruciate ligament or meniscus. But rarely performed due to cost, and not necessary.

### **Cranial cruciate ligament (CrCL) function and anatomy**

- The CrCL has two bands; the cranio-medial and the caudo-lateral
  - o The craniomedial band is always taught whereas the caudo-lateral is only taught in extension
  - o Therefore a (partial) caudo-lateral band rupture causes no palpable instability. But a craniomedial partial rupture causes instability in flexion.
- The CrCL is intra-articular but extra-synovial. It has a poor blood supply
- CrCL function is to prevent cranial tibial subluxation and internal rotation relative to the femur

## **Menisci – function and anatomy**

- C shaped fibro-cartilage anchored to tibial plateau & femur via ligaments
- 2 menisci – lateral & medial
- 5 ligaments – cranial intermeniscal, cranial medial & lateral menisco-tibial, caudal lateral menisco-femoral & caudal medial menisco-tibial (note different caudal attachments, the relative fixed caudal point of the caudal medial meniscus and hence its propensity to get crushed between femur and tibia. Therefore medial meniscus tears much more common than lateral.
- Triangular cross-sectional shape. Thin edge axial (central) – this edge is seen during arthrotomy / arthroscopy. The thin axial central edges are not constrained and can appear quite loose; in particular the axial edge of the normal medial meniscus can have an undulating / folded appearance. Thick edge abaxial (peripheral) – not seen as facing the joint capsule: usually only if a cranial folding bucket-handle tear of the caudal medial meniscus
- Blood supply - poor. Limited to only the outer abaxial 15-20% of so. Therefore healing potential very limited. Therefore meniscal repair / suturing rarely performed; instead simply resect the damaged portion of the meniscus.
- Meniscal function – load transfer across the joint, load absorption (hoop stresses), joint stabilisation (act like chucks on a vehicle wheels), proprioception, joint lubrication, prevent synovial impingement.
- Meniscal tears: 20-70% of cranial cruciate ligament stifles
  - o Medial meniscus (almost always)
  - o Tears – longitudinal / bucket handle / transverse / folded caudal pole
  - o Treatment for most tears = removal / surgical excision. Otherwise persistent lameness

### **The case for meniscal inspection (or not?). The evidence is:**

- VCOT 2008. Post-op cruciate surgery: acute onset lameness is most commonly caused by late meniscal tear in 75% of cases. 96.5% of these subsequently improved with second surgery. Suggests meniscal tear is painful and should be treated surgically
- JSAP 2008. TTA – 8.5% symptomatic late meniscal tear rate. Lameness resolved with partial resection
- Vet Surg 2011. 32.2% meniscal tear rate. 5.6% post op TPLO meniscal tear rate. Less likely with partial tear than full tear. Lameness resolved after LMT treated with partial meniscectomy. Important to check the meniscus. Evidence against TPLO?
- Vet Surg 2014: 83% meniscal tear diagnosis with arthroscopy, 44% with arthrotomy. 1.9 times more likely to diagnose with arthroscopy. Subsequently 11% meniscal tear rate when no meniscal release, 0% when meniscal release
- JSAP 2016 (2 publications): quality of evidence is low and the case for meniscal inspection or not cannot be assessed

### **The case for meniscal release (or not?). The evidence is:**

- VCOT 2005: cadaver MRI study, cruciate deficient stifle. Evidence of caudal pole medial meniscal crushing that was ameliorated by meniscal release
- Vet Surg 2006: medial meniscus limits tibial translation and is therefore at greater risk of tearing with cruciate rupture; TPLO surgery may spare the medial meniscus by neutralizing tibial thrust. So meniscal release may not be indicated for CrCl rupture stabilised by TPLO
- Vet Surg 2006: late meniscal tear more likely for dogs that had arthrotomy and no release compared to arthrotomy with release or arthroscopy with no release. Consider meniscal release when full meniscal inspection cannot be completed e.g. when doing arthrotomy as apposed to arthroscopy?
- VCOT 2007: mini-arthrotomy is more reliable (81% successful, 4% iatrogenic damage rate) than other techniques to safely performing meniscal release
- Vet Surg 2009: in normal dogs, meniscal release caused more lameness and osteoarthritis than dogs that did not have meniscal release. Should take into consideration before doing MR.
- JSAP 2010: risk of meniscal tear increases for complete CrCL rupture, by 2.6% for each additional week of lameness, and by 1.4% for each increase kg bodyweight

## Surgical approaches to the stifle:

- Lateral approach – standard. Use with lateral fabella suture / concurrent patellar luxation. Leaves obvious scar in thin-haired patients.
- Medial approach - standard with TPLO and TTA. Often as mini arthrotomy. Inspection of caudal medial meniscus possible but can be more challenging
- Full approach - up to and beyond level of patella & patellar fibro-cartilage – easier if starting otherwise not necessary & care to close the patellar fibro-cartilage otherwise risk of patellar luxation?
- Mini approach – sub patellar – patellar fibro-cartilage / patella-femoral ligament not compromise so risk of patellar luxation be less.
- Arthroscopy – better meniscal tear detection rate (as above), less progression of DJD? Technically more difficult & need specific equipment.
- Use of Gelpi retractors and Stifle distractors makes intra-articular inspection much more straightforward, and meniscal inspection with mini arthrotomy very straightforward.

## Cruciate rupture – Treatment options / extra-capsular stabilisation?

- VCOT 2014: survey of American surgeons:
  - o Extra-capsular stabilisation most common for dogs <9.1kg
  - o TPLO most common in large (27kg) dogs
  - o Surgeons – 64% TPLO, 15% extra-capsular sutures
  - o General practitioners: 38% extracapsular suture, 30% TPLO.

## Conservative management?

- Minimal lameness / partial cruciate rupture / anaesthetic risk too high / pyoderma / finances
- ? small dog ? but high Tibial Plateau Angle?
- OPINION – Almost all (small) dogs benefit from TPLO / CWO-TPLO. Just like big dogs!
- VCOT 2013: Small dogs <15kg. 15% vets opted for surgery. For surgery, 63% extra-capsular sutures. BUT depends on severity of lameness, age, bodyweight, degree of instability & lameness

## Surgical management

- Lameness not improving / confirm the diagnosis / check and treat the menisci
- OPINION – Almost all dogs benefits from surgery = TPLO
- Options:
  1. Extra-capsular sutures (ECS)
    - No isometric points
    - Sutures break / slacken within 6 weeks
    - Dogs do OK but not as well as with osteotomies
    - JAVMA 2005: Labradors with CrCI rupture: outcome better with ECS & TPLO compared to intra-capsular suture
    - VCOT 2010: looking for isometric points to placed ECS. Found the most isometric points of the pairs tested
    - Vet Surg 2014: in cats, lateral fabella to tibial cortex / patellar tendon insertion is the best quasi-isometric points
    - JAVMA 2010: 4.2% infection rate with ECS. 8.4% for TPLO
    - JAVMA 2013: outcome for 40 dogs with TPLO better than 40 dogs with ECS
    - VCOT 2013: 2 different ECS / lateral suture models: neither restored normal femero-tibial kinematics
    - T Prax 2015: dogs <15kg with CrCLR: 91% of TPLO dogs and 29% of ECS dogs regained “normal” stifle function i.e. TPLO outcome is better in small dogs

## 2. Extra-capsular Tightrope (TR)

- Vet Surg 2010: Over-tightening the suture may increase lateral compartment pressure
- Vet Surg 2013: Outcome with TPLO and TR better than TTA
- Vet Surg 2014: tightrope & percutaneous lateral fabella suture: similarly resists cranial translation but not restore biomechanics of normal CrCL
- Vet Surg 2014: tightrope is technically harder and has more technical deviations than lateral fabella suture

## 3. Fibular Head Transposition

- JAVMA 1989: 20% complication rate (seroma or fibular fracture). 90% good / excellent outcome
- JAAHA 1996: dogs treated with lateral fabella suture did better than conservative or FHT.

## 4. Intra-Capsular suture (ICS) / fascia lata graft

- Largely outdated
- JAVMA 2005: Labradors having ICS did worse than ECS or TPLO.

## 5. Tibial Plateau Levelling Osteotomy (TPLO)

- OPINION – this is the best treatment option currently available for CrCL rupture
- BUT it takes training and experience to be good and avoid complications – see webinar 3!
- Variation = cranial closing wedge osteotomy (CWO-TPLO)

## 6. Tibial Tuberosity Advancement (TTA)

- Originally adapted from the human Maquet Procedure
- Now multiple variants available e.g. Orthomed MMP, Fusion MMP, Kyon TTA & TTA2, Leibinger (Vi) TTA Rapid etc.
- OPINION – produces good results, but not as good as TPLO. More prone to complications & dogs that don't do as well – low grade grumbling lameness
- See Webinar 2!

## 7. Triple Tibial Osteotomy (TTO)

- Performed by very few people
- OPINION – unnecessarily complicated & there are better techniques out there
- VCOT 2006: 64 cases. Easy to learn, good outcome, 23% minor intra-operative complications, 11% post-op complications.
- JSAP 2009: 21 initial cases. 59% intra-operative fracture rate (minor). 23% major post-op complications, 18% needed further surgery. Dogs did well & improved
- VCOT 2009: 97 stifles. Incomplete osteotomies achieved 79%. 23% early post-op complications. 3% late meniscal tear rate

## 8. Total Knee Replacement ( Biomedtrix)

- Salvage procedure
- Little good evidence out there
- Outcomes seem favorable & dogs generally do well