

COMPARISON OF THE TIBIAL MECHANICAL JOINT ORIENTATION ANGLES IN DOGS WITH CRANIAL CRUCIATE LIGAMENT RUPTURE



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INTRODUCTION

Background

- Bilateral cranial cruciate ligament (CrCL) rupture, concurrent or subsequent to the initial diagnosis is the highly prevalent (59 – 61%).^{1,2}
 - 11 – 17% of dogs present with bilateral rupture (BR).^{1,2}
 - 22 – 56% of dogs with unilateral rupture develop subsequent contralateral rupture (UR-SR).¹⁻⁶
 - The remaining dogs with unilateral rupture do not develop subsequent contralateral rupture (UR-w/o-SR).¹⁻⁶
- Currently, it is unknown why some dogs develop contralateral CrCL rupture (BR and UR-SR) and others do not (UR-w/o-SR).
- Many have theorized that variation in tibial morphology, and in particular a increased tibial plateau angle (TPA), can result in significant micro-injury to the CrCL.⁷⁻¹⁰
- Tibial morphology can also be assessed using the tibial mechanical joint orientation angles (TMJOAs: mCaPTA, mechanical caudal proximal tibial angle; mCrDTA, mechanical cranial distal tibial angle; mMPTA, mechanical medial proximal tibial angle; mMDTA, mechanical medial distal tibial angle), and the tibial mechanical sagittal plane alignment (SPA) and frontal plane alignment (FPA).¹¹⁻¹³
- The TMJOAs have been reported for dogs with CrCL rupture, but have not been compared between dogs with UR-w/o-SR, UR-SR, and BR.^{11,12}
- If variation in tibial morphology plays a role in the development of CrCL rupture, analyzing the TPA, TMJOAs, SPA, and FPA, may detect differences between dogs with UR-w/o-SR, UR-SR, and BR.

Objectives

- To compare the TPA, TMJOAs, SPA, and FPA, between dogs with UR-w/o-SR, UR-SR, and BR.

Null Hypothesis

- The TPA, TMJOAs, SPA, and FPA, are not statistically different between dogs with UR-w/o-SR, UR-SR, and BR.

MATERIALS & METHODS

Historical Cohort

- The medical records of all dogs undergoing surgical treatment for CrCL rupture from July 1, 2006 to June 30, 2007 were reviewed.
- Chondrodysplastic and toy breeds were excluded, along with cases with prior surgical treatment for CrCL rupture, or additional stifle diseases.
- Bilateral stifle radiographs were available for all dogs, and CrCL was confirmed arthroscopically for all cases.
- The TPA, TMJOAs, SPA, and FPA, were measured for all dogs bilaterally.

Group Classification

- Cases were defined as UR or BR based on the orthopedic exam findings.
- UR cases were defined as UR-SR or UR-w/o-SR, based on long-term follow-up, censored at 3-years; long-term follow-up was obtained from the medical record or from telephone calls to the primary care veterinarian.

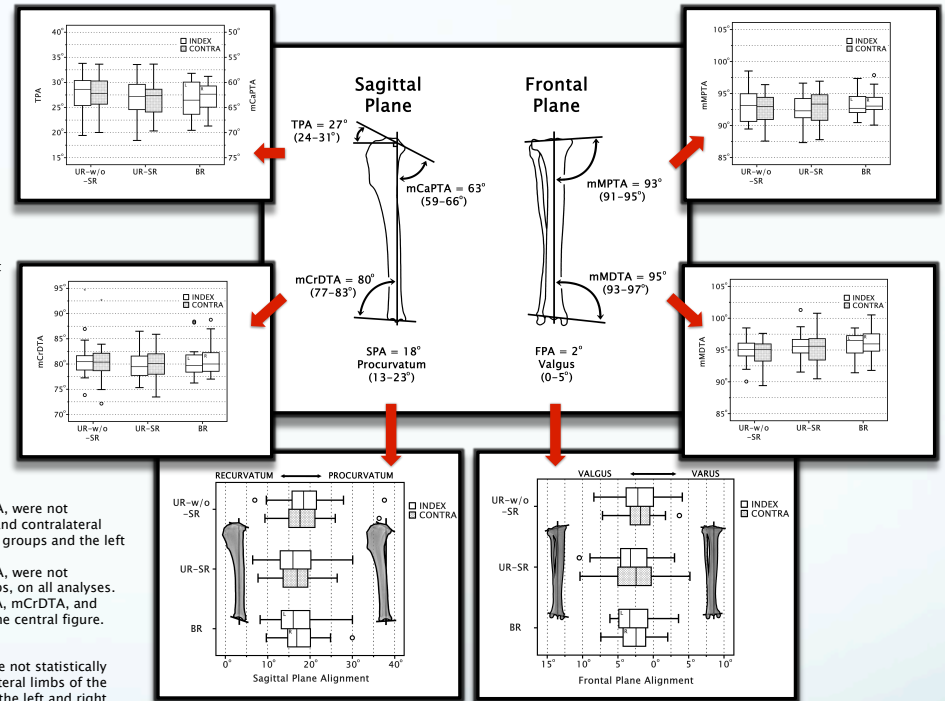
Statistical Analysis

- The Fisher's exact test, chi-square test of homogeneity, and Kruskal-Wallis test were used to evaluate for differences between groups, in regards to gender, reproductive status and body condition score, breed distribution, age, body weight and duration of lameness.
- The Wilcoxon signed rank test was used to compare the TPA, TMJOAs, SPA, and FPA, of the index and contralateral limbs (left and right limbs for the BR group), within groups.
- The Kruskal-Wallis test was used to compare the TPA, TMJOAs, SPA, and FPA, of the index and contralateral limbs for the UR-SR and UR-w/o-SR groups, with the left and right limbs of the BR group, and the averaged values, between the three groups.
- P-values < 0.05 were considered significant.

RESULTS

Descriptive Statistics

- Of the 182 dogs that underwent stifle arthroscopy for CrCL rupture during the study period, 92 dogs met the inclusion criteria.
- 34 dogs (37.0%) were classified as UR-w/o-SR.
- 38 dogs (41.3%) were classified as UR-SR.
- 20 dogs (21.7%) were classified as BR.
- 28 different breeds were represented, with 34 dogs (37.0%) being Labrador Retrievers.
- There were 55 spayed females (59.8%), 3 intact females (3.3%), 27 neutered males (29.3%) and 7 intact males (7.6%).
- There were no statistically significant differences for age, gender, reproductive status, breed, body weight, body condition score, and duration of lameness between groups.



Sagittal Plane

- The TPA, mCaPTA, mCrDTA and SPA, were not statistically different for the index and contralateral limbs of the UR-w/o-SR and UR-SR groups and the left and right limbs of the BR group.
- The TPA, mCaPTA, mCrDTA and SPA, were not statistically different between groups, on all analyses.
- The mean ± SD of the TPA, mCaPTA, mCrDTA, and SPA, for all dogs, are displayed in the central figure.

Frontal Plane

- The mMPTA, mMDTA, and FPA, were not statistically different for the index and contralateral limbs of the UR-w/o-SR and UR-SR groups and the left and right limbs of the BR group.
- The mMPTA, mMDTA, and FPA, were not statistically different between groups, on all analyses.
- The mean ± SD of the mMPTA, mMDTA, and FPA, for all dogs, are displayed in the central figure.

DISCUSSION / CONCLUSION

- The null hypothesis was accepted: The TPA, TMJOAs, SPA, and FPA, are not statistically different between dogs with UR-w/o-SR, UR-SR, and BR.
- If variation in tibial morphology plays a role in the development of CrCL rupture, assessment using the TMJOAs, SPA, FPA and TPA (in the range studied: all TPAs were <35°), were not effective in distinguishing between dogs who develop contralateral CrCL rupture (BR and UR-SR) and dogs who do not (UR-w/o-SR).
- To further evaluate the role of tibial morphology in the pathogenesis of CrCL rupture, analysis using the tibial anatomic axes should be considered.¹⁴⁻¹⁶

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