Research in Cranial cruciate-deficient canine stifle and Tibial Tuberosity Advancement

Summary / Zusammenfassung
Rupture of the CrCL is one of the most frequent causes of hind limb lameness in the dog, having an estimated economical impact of 1.32 billions of American Dollars per year, only in the United Stated of America, in 2003. The CrCL undergoes a degenerative process that results in its partial and later complete rupture with reasons that are still not completely understood. Age, body weight, breed, sex, diet, immune-mediated disease and conformation abnormalities have been related to the disease.

Two recent studies from our Institution evaluated and compared the angle between the tibial plateau and the patellar ligament in dogs with sound stifles and dogs with surgically confirmed partial CCL rupture. It was demonstrated that the angle between the patellar ligament and the tibial plateau is larger in dogs with CCLD than the same angle in sound dog stifles. Being the angle between patellar ligament and tibial plateau larger, the CCL will be loaded with greater forces during the weight-bearing phase of the stride, which may contribute to its degenerative process. This angle is larger not only in cases of a steeper TPA, but could also result from anatomical differences in the form of femoral condyles, femoral trochlea or/and tibial tuberosity.

To identify differences in the conformation of the canine stifle that could lead to CrCLD, 100 medio-lateral stifles radiographs of sound dogs and of CrCLD stifles were evaluated and the results of this study were recently published. The conclusions of that study showed that development of the tibial tuberosity and shape (convexity) of tibial condyles appear to be relevant in the pathogenesis of CrCLD.

Tibial Tuberosity Advancement (TTA) was developed at the University of Zurich in 2002, to restore dynamic stability in CrCLD-stifles. Stability is accomplished by an osteotomy of the tibial tuberosity in the frontal plane with advancement of the insertion of the patellar ligament. By changing the angle between patellar tendon and tibial plateau, shear forces are eliminated and the stifle renders dynamically stable. In vitro experimental studies validated the mechanics of TTA, and clinical reports showed a satisfactory function after surgery.

Radiographic and Ultrasonographic Evaluation of the Patellar Ligament Following Tibial Tuberosity Advancement
Patellar tendinitis has been reported following tibial plateau leveling osteotomy (TPLO), however, it has not been investigated in Tibial Tuberosity Advancement (TTA). It was hypothesized, that there is less stress on the patellar tendon with TTA than with TPLO. The purpose of the present study was to radiographically and ultrasonographically evaluate the patellar tendon pre- and post- TTA. In this study, the patellar tendon was evaluated in 22 stifles (21 dogs) preoperatively and at 6 -8 weeks (n=18) and 16 weeks (n=17) post-TTA. Radiographically, the proximal and distal thickness and the total length of the patellar tendon were evaluated. Ultrasound evaluation included the total length, transverse thickness and cross-sectional area measurements at 3 different levels, as well as a subjective grading of the ultrasound changes. At the first post-operative examination, radiographic and ultrasonographic measurements of patellar tendon thickness increased (P < 0.0001 – 0.01) and the ultrasonographic subjective score worsened (P = 0.0002). At the second follow-up, radiographic and ultrasonographic measurements were not significantly different from the first follow-up examination, but the ultrasonographic subjective score improved (P = 0.01). In dogs, in which a larger cage was used, ligament thickness increased radiographically and ultrasonographically at first and second follow-up examination (P = 0.009-0.03). In the 18 dogs with arthrotomy, the increase in radiographic and ultrasonographic ligament thickness at the first and second follow-up examination was significantly higher compared to the 3 dogs without
arthrotomy (P = 0.01-0.04). In conclusion, although there is less stress on the patellar tendon with TTA, patellar tendinitis was a common postoperative sequela in the present study. Other causes such as surgical trauma, arthrotomy, perfusion injury, complete versus partial CrCL rupture, excessive advancement, excessive postoperative activity or altered insertion angle of the patellar ligament at the tuberositas tibiae should be also considered and elucidated in a larger study cohort.

**Publications / Publikationen**


**Keywords / Suchbegriffe**

Tibial Tuberosity Advancement, TTA, dog, stifle biomechanics.

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