Theory/Biomechanics
Just why does "TTA" it work?

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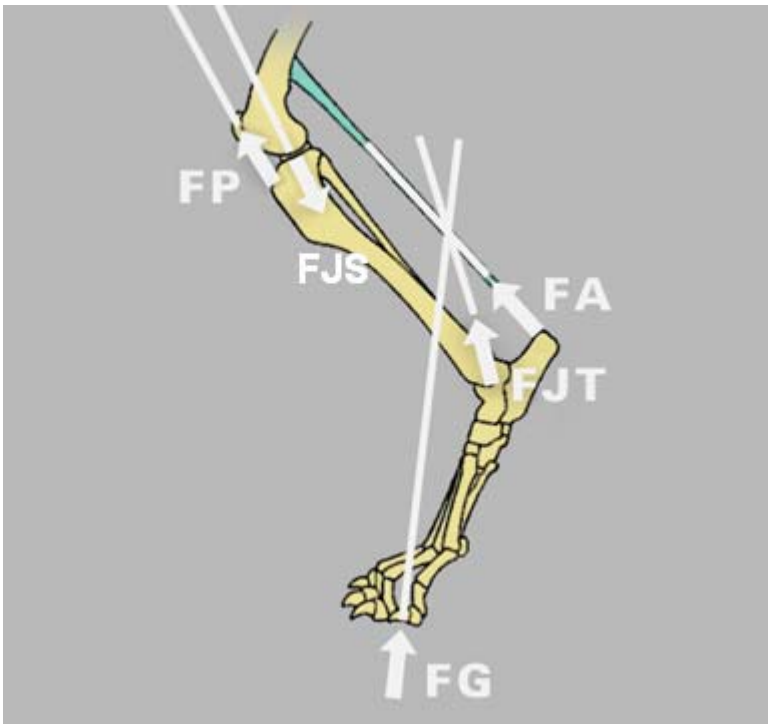
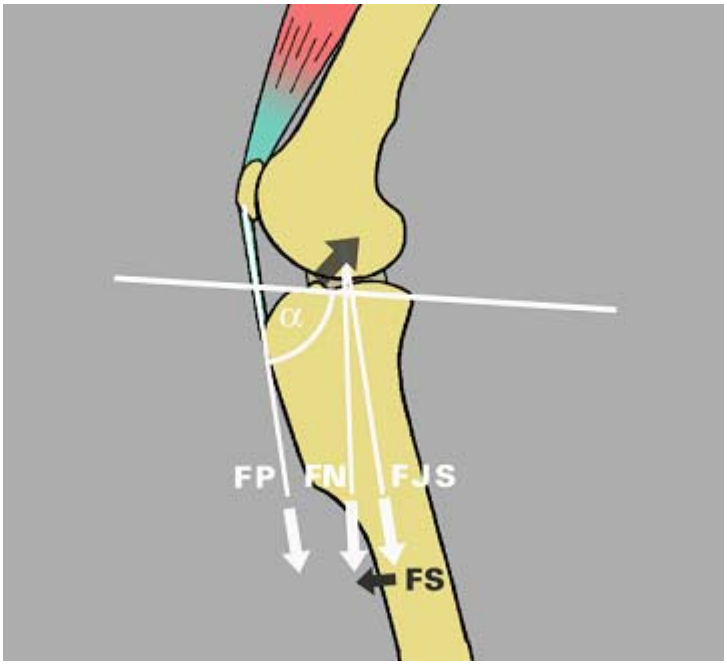
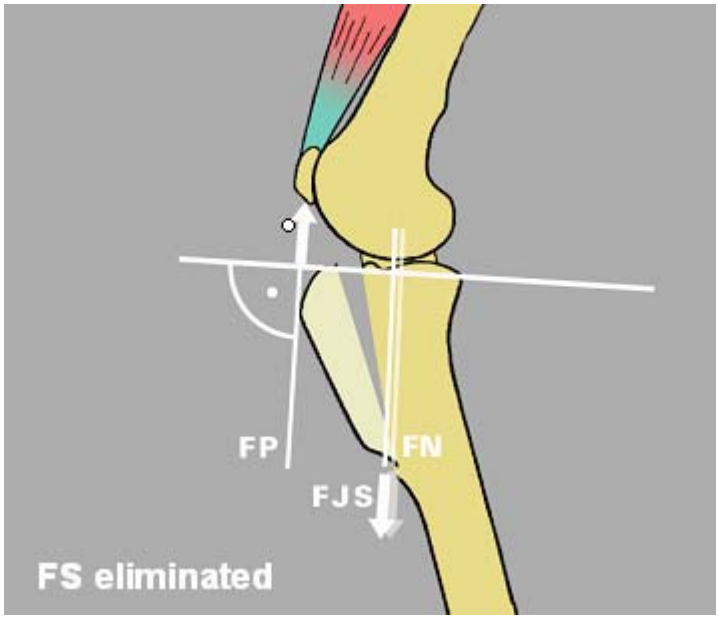
In the diagram marked (X),the average canine stifle is loaded with a force (FG). The Achilles tendon reacts with a force (FA) that results in a net force on the tarsal joint (FJT). The patellar tendon reacts with a force (FP) to stabilize the stifle. Consequently, the stifle reacts with a force (FJS) almost parallel to the patellar tendon.



Now if we take a closer look at the stifle joint, If the tibial plateau is not perpendicular to F(P), then F(JS) does not superimpose the normal compressive force F(N) of the stifle and a tibiofemoral shear force F(S) results which overloads the CrCL-deficient stifle resulting in cranial tibial thrust or subluxation when the CrCL is torn.

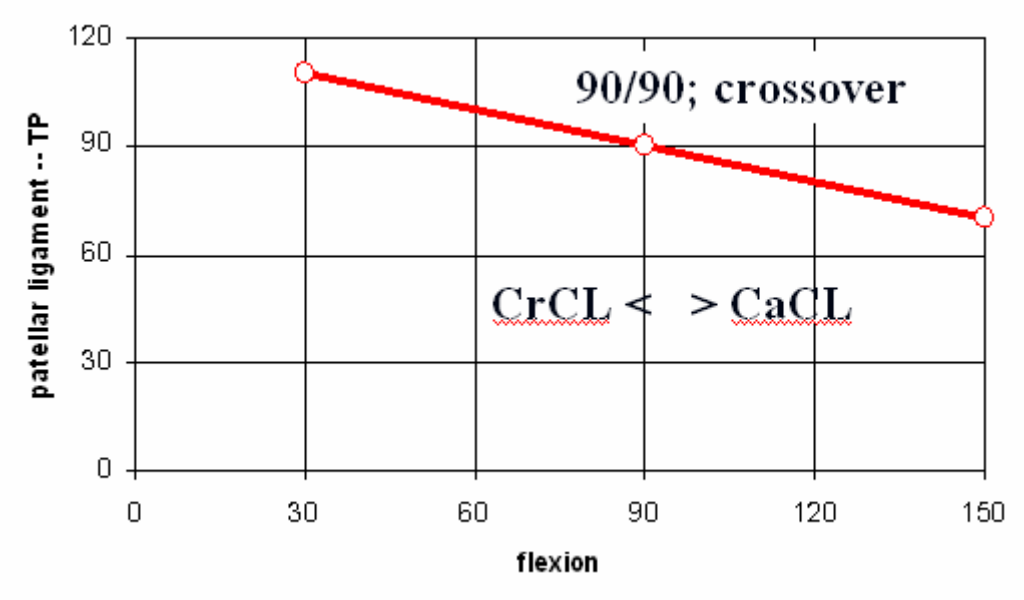




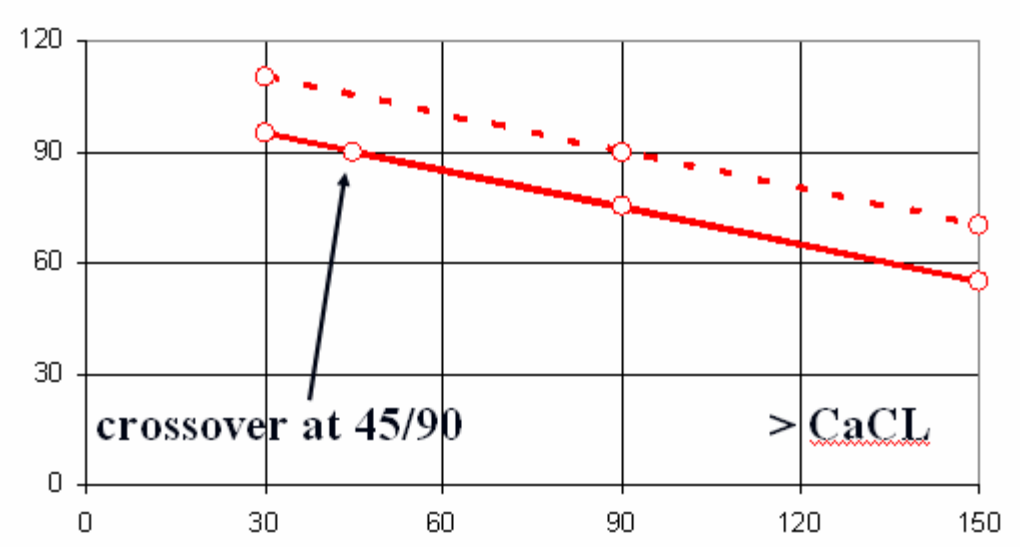
Tibial tuberosity advancement positions F(P) perpendicular to the tibial plateau and eliminates F(S) by superimposing F(JS) over F(N).

Lets define the total joint force as being approximately parallel to the patellar ligament. If the patellar ligament and tibial plateau are perpendicular, there is no shear component of the total joint force and no strain on the cruciate ligaments. But the angle between the patellar ligament and tibial plateau changes with flexion and

extension, and is 90 degrees at 90 degrees of flexion---the cross-over point. In full extension, the angle between the tibial plateau and patellar ligament is 105 degrees, while in full flexion it is 70 degrees. Thus in full extension the CrCL is loaded, in full flexion the CaCL is loaded relative to the cross-over point.



In the CrCL deficient stifle, we can move the cross-over point to full extension. In the case of the graph, at 45 degrees of flexion, the patellar ligament is at 90 degrees to the tibial plateau, the cruciates are under minimal stress, favoring the CaCL. (In the graph, the top line is the original cross-over point data, the bottom line is the new cross-over point data). In other words, moving the tibial tuberosity cranially to a point where the patellar ligament is perpendicular to the tibial plateau, the angle between the patellar tendon and tibial plateau can not exceed 90 degrees, thus you never reach an angle that would result in loading of the CrCL.


120
90
60
30
0
0
30
60
90
120
150
crossover at 45/90
> CaCL